

DRAFT FINAL

Amended Closure Plan Hazardous Waste Storage Area (Building 560)



**Rickenbacker Air National Guard Base
Columbus, Ohio**

Volume I: Report and Appendices

Prepared For

**Air Force Center for Environmental Excellence
Technology Transfer Division
Brooks Air Force Base
San Antonio, Texas**

and

**Air Force Base Conversion Agency
Operating Location - Rickenbacker
Columbus, Ohio**

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DRAFT FINAL

**AMENDED CLOSURE PLAN
HAZARDOUS WASTE STORAGE AREA
BUILDING 560**

at

**RICKENBACKER AIR NATIONAL GUARD BASE
COLUMBUS, OHIO**

February 1998

Prepared for:

**AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
TECHNOLOGY TRANSFER DIVISION
BROOKS AIR FORCE BASE
SAN ANTONIO, TEXAS**

AND

**AIR FORCE BASE CONVERSION AGENCY
OPERATING LOCATION - RICKENBACKER
COLUMBUS, OHIO**

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EXECUTIVE SUMMARY

This amended closure plan describes the proposed closure approach for the former hazardous waste storage area (HWSA) at Building 560, Rickenbacker Air National Guard Base (ANGB), Ohio. The former HWSA is located at the edge of the shop area in the northern section of the Base. The HWSA was a permitted Resource Conservation and Recovery Act (RCRA) storage facility that received wastes generated during Base activities from 1983 through 1986. Wastes stored at the HWSA consisted primarily of acids, various solvents and cleaning solutions, petroleum products, and spent desiccants. Waste was stored in small containers placed on pallets inside Building 560 and in larger, 55-gallon drums outside the building (within the fenced yard). Additionally, 15 underground storage tanks (USTs) were previously located at or near the HWSA. These USTs were used for the storage of fuel waste, waste petroleum products, and deicing fluid. The Air Force Base Conversion Agency (AFBCA) has been granted No Further Response Action Planned (NFRAP) status for the tanks. Residual contamination in soil and groundwater is addressed as part of the closure approach presented in this closure plan. This amended closure plan was prepared in compliance with the Ohio Administrative Code (OAC) Chapter 3745 Part 66 and the Code of Federal Regulations (CFR), Title 40 Part 265, Subpart G.

The closure approach presented in this plan is intended to supersede the closure approach presented in the February 1997 amended closure/post-closure plan (Parsons Engineering Science, Inc. [Parsons ES], 1997a) which was approved with modifications by the Ohio Environmental Protection Agency (Ohio EPA) on May 19, 1997. The February 1997 plan (Parsons ES, 1997a) proposed closure of the HWSA utilizing natural chemical attenuation processes and additional untested source area remedial technologies (i.e., bioventing and air sparging) to minimize contaminant mass, mobility, persistence, and toxicity. Because no remediation standards or risk-based health standards were presented in the February 1997 closure plan, Ohio EPA gave approval for closure of the site as a landfill, with all post-closure care requirements

being applicable. The closure period was extended by Ohio EPA to October 2000 to ensure that the final closure strategy is compatible with the planned future use of the HWSA as a paved taxiway.

In compliance with the February 1997 amended closure/post-closure plan, additional site assessment activities were initiated by Parsons ES and International Technology Corporation (IT). The additional site assessment activities to be performed were documented in a June 1997 work plan (Parsons ES, 1997b). The primary purpose of these activities was to collect sufficient site-specific data to develop risk-based health standards for the HWSA through a site-specific risk assessment, and to evaluate the effectiveness of proposed source-reduction technologies (bioventing and air sparging), in the event risk reduction through source area remediation is required under the proposed risk-based closure. The results of the 1997 site assessment activities and the risk assessment are presented in this amended closure plan.

The risk assessment demonstrated that existing concentrations of organic and inorganic compounds in soil and groundwater do not pose unacceptable carcinogenic risks (greater than 1 in 100,000, or 10^{-5}) or noncancer hazards (hazard index greater than 1) under current or future receptor exposure scenarios. Considering these findings, a risk-assessment based closure is proposed for the HWSA. To implement closure of both soils and groundwater, the following activities have been completed or are proposed to be completed as discussed in this closure plan:

- Removal of the remaining four USTs (completed February 1995);
- Decontamination of Building 560 by cleaning the building and the drum wash pad (completed April 1996);
- Installation of ten new monitoring wells in the vicinity of the HWSA and comprehensive groundwater sampling from 37 site monitoring wells (completed July 1997);

- Sampling of soil and soil gas in the vicinity of Building 560 (completed August 1997);
- Treatability testing for determination of the effectiveness of air injection bioventing, in the event residual organic soil contamination required limited *in situ* remediation based on the findings of the risk assessment (completed August 1997);
- Treatability testing for determination of the effectiveness of air sparging in the event site impacted groundwater required *in situ* remediation based on the findings of the risk assessment (completed December 1997);
- Development of risk-based health standards for the HWSA based on a comprehensive risk assessment of the site (completed within this plan);
- Natural oxidation of residual dissolved fuel hydrocarbons and natural reductive dehalogenation of residual dissolved chlorinated organics (in progress);
- Installation of one additional downgradient monitoring well cluster in order to completely delineate the extent of the chlorinated organics plume (proposed);
- Continued monitoring of the groundwater chemicals of potential concern (COPCs) identified in the risk assessment (proposed);
- Institution of land-use controls through a deed restriction upon transfer of the HWSA property (proposed); and
- Eventual exposure control by installation of taxiway (proposed as future land use).

With the exception of the taxiway installation, all closure activities, as outlined above, will be complete by October 2000. No post-closure care period will be necessary based upon the risk-assessment closure approach presented in this plan.

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ACRONYMS AND ABBREVIATIONS

AFBCA	Air Force Base Conversion Agency
AFCEE	Air Force Center for Environmental Excellence
AMC	Air Mobility Command
ANGB	Air National Guard Base
bgs	below ground surface
BCT	Base closure team
BTEX	Benzene, toluene, ethylbenzene, and xylenes
BUSTR	Ohio Department of Commerce, Division of State Fire Marshal, Bureau of Underground Storage Tank Regulation
CAH	Chlorinated aliphatic hydrocarbon
CFR	Code of Federal Regulations
cm ²	Square centimeter
CME	Comprehensive Groundwater Monitoring Evaluation
COPC	Contaminants of potential concern
CPT	Cone penetrometer
CSF	Oral carcinogenic slope factor
CSM	Conceptual site model
DCA	Dichloroethane
DCE	Dichloroethene
DERR	Ohio EPA, Division of Emergency Remedial Response
DHWM	Ohio EPA, Division of Hazardous Waste Management
DO	Dissolved oxygen
DOD	Department of Defense
DPDO	Defense Property Disposal Office
DRMO	Defense Reutilization and Materials Office
DRO	Diesel-range organics
ES	Engineering-Science, Inc.
ET	Exposure time
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
FR	Federal Register
ft/day	Feet per day
ft/ft	Foot per foot
ft/yr	Feet per year
GRO	Gasoline-range organics
HEAST	Health Effects Assessment Summary Tables
HI	Hazard index
HPLC	High-performance liquid chromatography
HQ	Hazard quotient
HWSA	Hazardous Waste Storage Area
ID	Inside diameter
in/hr	Inches per hour
IRIS	Integrated Risk Information Service
IRP	Installation Restoration Program
IT	International Technology Corporation
IUR	Inhalation unit risk factor
LIF	Laser-induced fluorescence

LNAPL	Light nonaqueous-phase liquid
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
MDL	Method detection limit
µg/kg	micrograms per kilogram
µg/L	Micrograms per liter
mg/kg	milligrams per kilogram
mg/kg-day	Milligrams per kilogram per day
mg/L	milligrams per liter
MP	Monitoring point
msl	Mean sea level
NFRAP	No Further Response Action Plan
NOAEL	No-observed-adverse-effect level
NRMRL	National Risk Management Research Laboratory
OAC	Ohio Administrative Code
ORC®	Oxygen Release Compound
Ogden	Ogden Environmental and Energy Services, Inc.
Ohio EPA	Ohio Environmental Protection Agency
Parsons ES	Parsons Engineering Science, Inc.
PCB	Polychlorinated biphenyl
PEF	Particulate emission factor
ppmv	parts per million, by volume
PRG	Preliminary remediation goal
PVC	Polyvinyl chloride
RAGS	Risk Assessment Guidance for Superfund
RBCA	Risk-based closure action
RCRA	Resource Conservation and Recovery Act
redox	Oxidation/reduction
RfC	Inhalation reference concentration
RfD	Oral reference dose
RME	Reasonable maximum exposure
RNA	Remediation by natural attenuation
RPA	Rickenbacker Port Authority
SSTL	Site-specific target level
SVOC	Semivolatile organic compound
SW	Sparge well
TAL	Target analyte list
1,1,1-TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TMB	Trimethylbenzene
TOC	Top of casing
TPH	Total petroleum hydrocarbons
UCL	Upper confidence limit
USACE	US Army Corps of Engineers
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
UST	Underground storage tank
UWBZ	Upper water-bearing zone
VAP	Voluntary Action Program

VC
VOC
VW

Vinyl chloride
Volatile organic compound
Vent well

SECTION 1

FACILITY DESCRIPTION

1.1 INTRODUCTION

This amended closure plan is submitted by the Air Force Base Conversion Agency Operating Location-Rickenbacker (AFBCA) in compliance with the Ohio Administrative Code (OAC) Chapter 3745 Part 66, and Code of Federal Regulations (CFR) Title 40 Part 265, Subpart G. This amended closure plan is submitted to the Ohio Environmental Protection Agency (Ohio EPA) Department of Hazardous Waste Management (DHWM) for consideration and approval. As part of the Installation Restoration Program (IRP), AFBCA has identified the former hazardous waste storage area (HWSA) at Building 560, located at Rickenbacker Air National Guard Base (ANGB), for closure. This amended closure plan was prepared by Parsons Engineering Science, Inc. (Parsons ES) under contract with the Air Force Air Mobility Command (AMC) and the Air Force Center for Environmental Excellence (AFCEE). Existing site characterization data and data collected by International Technology Corporation (IT) (under a separate contract with AFCEE) during 1997 assessment activities were used to prepare a risk-based closure recommendation for soil and groundwater at the HWSA.

1.1.1 Closure Plan Objective

The purpose of this amended closure plan is to present the results of a site-specific risk assessment conducted for the HSWA, and to propose risk-based health standards developed for the site. These health standards are intended to be protective of human health and the environment under realistic current and future land use and receptor exposure scenarios. If environmental contaminants in soil and groundwater exceed the health standards then the results of additional assessment activities performed at the

HWSA in 1997 will be used to optimize/guide the remedial approach to obtain site closure. If it is determined that site contaminants do not exceed remedial goals, then a risk-based closure will be requested for the site following sufficient confirmation monitoring.

This amended closure plan supersedes the February 1997, Ohio EPA-approved amended closure/post-closure plan (Parsons ES, 1997a). In lieu of risk-based cleanup goals, the February 1997 amended closure/post-closure plan was approved as a landfill closure with all post-closure care requirements as specified in the state Resource Conservation and Recovery Act (RCRA) facility closure guidance (Ohio EPA 1993a). This amended plan develops health standards or cleanup goals for affected media at the HWSA in accordance with Ohio EPA (1993b) risk-based closure action (RBCA) guidance.

1.1.2 Regulatory Framework

1.1.2.1 Site Background

A notification of hazardous waste activity and a RCRA Part A (Interim Status) application was submitted to the US Environmental Protection Agency (USEPA) by Rickenbacker ANGB on March 22, 1983. The site was granted USEPA Interim Status Permit #OH3571924544, but the application was not processed for Ohio, and a Part B permit application was not submitted (Ohio EPA, 1995a). The HWSA was used from 1983 to 1986 for the storage of drummed hazardous wastes generated at the Base. Additionally, 15 underground storage tanks (USTs) used for the storage of fuel, waste petroleum products, and deicing fluid were formerly located at, or within the vicinity of, Building 560/HWSA.

The following information was summarized from the Comprehensive Groundwater Monitoring Evaluation (CME) conducted by Ohio EPA (1995a). A closure plan for Building 560 was submitted to the Ohio EPA on April 15, 1987. The plan was rejected on April 6, 1988, and a revised closure plan was submitted on July 27, 1988. This plan was approved by Ohio EPA on September 29, 1988. On October 26, 1990,

Rickenbacker ANGB informed the Ohio EPA that a "clean closure" in accordance with the closure plan could not be achieved. Ohio EPA advised the Base to continue under the original plan until the vertical and horizontal extent of contamination could be determined.

On May 26, 1992, Rickenbacker ANGB submitted an amended closure/post-closure plan to close the HWSA as a landfill with engineered groundwater remediation to occur during the post-closure care period. Following Ohio EPA's issuance of a Notice of Deficiency on February 9, 1993, a revised closure/post-closure plan (Engineering Science, Inc. [ES], 1993) was submitted on March 15, 1993, and was approved by Ohio EPA on July 13, 1993. This plan proposed closure of the HWSA as a landfill with groundwater remediation via extraction and treatment. The closure plan also proposed completion of closure without a protective cap due to concerns that a cap would interfere with the groundwater extraction and treatment system.

On September 30, 1994, responsibility for closure of the HWSA was transferred from Rickenbacker ANGB to AFBCA. On January 27, 1995, AFBCA informed Ohio EPA that the effectiveness of the proposed groundwater extraction and treatment system was being questioned, and requested an extension of the closure period to allow for an assessment of the effectiveness of natural attenuation processes at remediating dissolved contamination at the HWSA. The extension was approved by Ohio EPA on March 21, 1995.

The findings of the AFCEE-funded remediation by natural attenuation (RNA) demonstration at the HWSA and revised closure recommendations were documented in an October 1995 amended closure/post-closure plan (Parsons ES, 1995a). On August 26, 1996, after review of the October 1995 plan, Ohio EPA informed AFBCA that reliance on natural chemical attenuation processes as the sole remedial action for closure would not be approved. Additionally, Ohio EPA noted that risk-based performance objectives should be established to support any closure recommendations.

In response to this technical direction, the AFBCA submitted a revised amended closure/post-closure plan that proposed various source reduction technologies (bioventing, air sparging/oxygen release compound [ORC®] injection) (Parsons ES, 1996). This plan was submitted to Ohio EPA on October 11, 1996. Following Ohio EPA's issuance of a Notice of Deficiency on January 23, 1997, the plan was modified to correct deficiencies and resubmitted by AFBCA on February 28, 1997 (Parsons ES, 1997a). This version of the amended closure/post-closure was released for public comment the week of March 17, 1997. Notification of formal approval of the plan with modifications by Ohio EPA was received on May 19, 1997. Ohio EPA-required modifications to the approved February 1997 closure plan were submitted to DHWM on July 22, 1997. Closure plan modifications significant to future site activities include:

- Closure approval of the HWSA as a landfill with all post-closure care requirements being applicable unless it can be demonstrated that risk-based health standards can be achieved at the end of the closure period; and
- Extension of the closure period until October 2000 to allow negotiations with the Rickenbacker Port Authority (RPA) to ensure that the final closure strategy is compatible with the planned future use of the HWSA.

In compliance with the February 1997 amended closure/post-closure plan, additional site assessment activities were initiated by Parsons ES and IT. The additional site assessment activities to be performed were documented in a June 1997 work plan (Parsons ES, 1997b). The primary purpose of these activities was to collect sufficient site-specific data to develop risk-based health standards for the HWSA and to evaluate the effectiveness of proposed source-reduction technologies (bioventing and air sparging). Source reduction technologies were tested in the event risk reduction through source area remediation was required to more rapidly attain the risk-based health standards for the site.

This amended closure plan presents the environmental data collected from the HWSA and surrounding area during the 1997 assessment activities, summarizes the results of bioventing and air sparging treatability testing, presents a site-specific risk assessment for contaminated soil and groundwater at the HWSA, proposes risk-based health standards in the form of site-specific target levels (SSTLs) for comparison and confirmation. Closure of the HWSA with no post-closure care is proposed following eight quarters of compliance groundwater monitoring and establishment of land use controls through restrictions on the deed for the property.

1.1.2.2 Regulatory Authority

The 15 USTs formerly located at, or the vicinity of, the HWSA were removed in 1994 and 1995. AFBCA received a "No Further Response Action Planned" (NFRAP) status from the Ohio Department of Commerce, Division of State Fire Marshal, Bureau of Underground Storage Tank Regulation (BUSTR) in March 1996. The NFRAP for four of the USTs was granted for tanks 47 through 50 under the condition that residual contamination in soils and groundwater be addressed in any forthcoming closure plans for the HWSA.

Closure of the HWSA is being conducted in accordance with Ohio EPA standards for RCRA hazardous waste interim facilities (OAC 3745, Chapters 65 through 69). The closure performance standard for interim facilities (OAC 3745-66-11) requires that closure:

- Minimize the need for further maintenance;
- Control, minimize, or eliminate to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste/hazardous constituents to groundwater, surface waters, or to the atmosphere; and
- Comply with various other OAC rules regarding closure of interim facilities.

Rules OAC 3745-66-10 to 3745-66-15 outline closure requirements, and OAC 3745-66-16 through 3745-66-20 specify post-closure care requirements applicable to all interim hazardous waste facilities. After closure plan approval by Ohio EPA, partial and/or final closure activities typically must be completed within 90 days; however, an extension can be requested from Ohio EPA as long as adequate steps are taken to prevent threats to human health and the environment (OAC 3745-66-13). An extended closure period until October 2000 was requested and approved by Ohio EPA for the February 1997 amended closure/post-closure plan (Parsons ES, 1997a). For the February 1997 plan (Parsons ES, 1997a), post-closure care based on a landfill closure is to begin after completion of closure activities and to continue for 30 years. However, the facility owner/operator can amend the closure plan at any time prior to notifying Ohio EPA of partial or final closure (OAC 3745-66-12), and the post-closure care period can be reduced if human health and the environment are sufficiently protected (OAC 3745-66-17). As with facility closure, the owner/operator can amend the post-closure plan any time during the post closure care period (OAC 3745-66-18). In addition, the owner/operator may petition the Ohio EPA to reduce the post-closure care period based on evidence demonstrating that the secure nature of the hazardous waste facility makes post-closure care requirements unnecessary or supports reduction of the post-closure care period (OAC 3745-66-18(G)). Applicable evidence indicating the secure nature of the facility includes leachate or groundwater monitoring results and application of advanced technologies.

1.1.2.3 Ohio EPA Risk-Based Closure Guidance

Authorization to consider risk assessment, or what constitutes "decontamination" of a site, as a closure option is provided by rule OAC 3745-67-28, which adopts federal regulations 51 FR 16422 and 52 FR 8704, promulgated on May 2, 1986 and March 19, 1987, respectively (Ohio EPA, 1993a). Currently applicable Ohio EPA (1993b) guidance is provided in the *Interim Final Guidance for Reviewing Risk-Based Closure Plans for RCRA Units*. This outlines two options for closing a RCRA unit when no further RCRA obligations are required for managing or monitoring the unit:

- Option 1 - Complete removal of waste materials and contaminated soils; or
- Option 2 - Complete removal of waste materials and decontamination of environmental media (soil, water, and air) to health-based standards.

For the second option, demonstration of acceptable decontamination is performed through a human health risk assessment for all impacted and potentially impacted environmental media to be left in place.

Site-specific demonstrations of protection of human health and the environment are required for a risk-based closure (Ohio EPA, 1993b). The owner/operator can propose site-specific, risk-based cleanup and closure strategies that address all routes of exposure and unacceptable risk. Site-specific, risk-based proposals must document that contaminants left in soil will not adversely impact environmental media (groundwater, surface water, or the atmosphere) and demonstrate that direct exposure of receptors through dermal contact, ingestion, or inhalation will not result in a threat to human health or the environment. Also, Ohio EPA (1993b) may consider an industrial exposure scenario if deed restrictions are placed on the property or if a permanent structure is placed directly over the unit.

Ohio EPA is in the process of revising current RBCA policy and procedures on various risk-based guidance issues and developing guidance consistent with DHWM and Division of Emergency Remedial Response (DERR) regulatory objectives. Included within this revision process is the development of cleanup criteria that reflect an acceptable carcinogenic target risk range (10^{-4} to 10^{-6}). Ohio EPA (1995b) has identified a 10^{-5} cumulative carcinogenic risk goal as acceptable to ensure protection of human health within the Voluntary Action Program (VAP) for DERR sites. For consistency, this target risk goal also has been adopted by other Ohio EPA programs, including DHWM programs (Ohio EPA, 1997). In addition, Ohio EPA is currently in the process of developing deed restriction guidance for site closures. This guidance is due out in early 1998.

1.2 REPORT ORGANIZATION

This amended closure plan consists of seven sections, including this introduction, and 10 appendices. A general facility background, including an overview of the environmental setting, is provided in the remainder of this section. Section 2 presents more detailed information on the HWSA history, a summary of the wastes that were stored at the site, and a discussion of the site's physical setting, and describes the current and future land uses for the site. Section 3 summarizes previous investigations and remedial activities performed at the site. Section 4 presents the results of the 1997 additional assessment activities performed at the HWSA and summarizes the nature and extent of contamination in soil and groundwater at the site. Section 5 represents a comprehensive risk assessment for the site and develops risk-based health standards for use in compliance monitoring. Section 6 explains the proposed closure activities to be implemented and includes a proposed schedule for closure activities. Section 7 presents references used in preparing this amended closure plan.

Appendix A presents available future land use documentation for the site, including example deed restriction language. Appendix B presents previous site analytical data collected from 1988 through 1996. Appendix C presents analytical data associated with the 1997 additional assessment activities. Appendix D presents available soil boring logs and well installation diagrams. Appendix E provides background data for soils and groundwater and provides text and summary tables related to the statistical analysis of site contaminants. Appendix F provides the background information for the development of preliminary remediation goals (PRGs). Appendix G provides the risk calculations and related risk assessment information. Appendix H presents the calculations used for the development of risk-based health standards. Appendix I presents the sampling and analytical procedures for future compliance monitoring to be conducted at the site, and Appendix J presents a health and safety plan for use during future site closure activities.

1.3 ENVIRONMENTAL SETTING OF RICKENBACKER AIR NATIONAL GUARD BASE

Rickenbacker ANGB is located 12 miles southeast of Columbus, and 0.5 mile east of Lockbourne, Ohio (Figure 1.1). The Base covers approximately 2,100 acres in Franklin and Pickaway Counties and is located on a glacial till plain between the Big Walnut and Walnut Creek drainage basins. The area has been used as an air base under the custody of various government branches, including the Army Air Corps and the Air National Guard, since 1942. Access to the Base is restricted through a continuously guarded entrance.

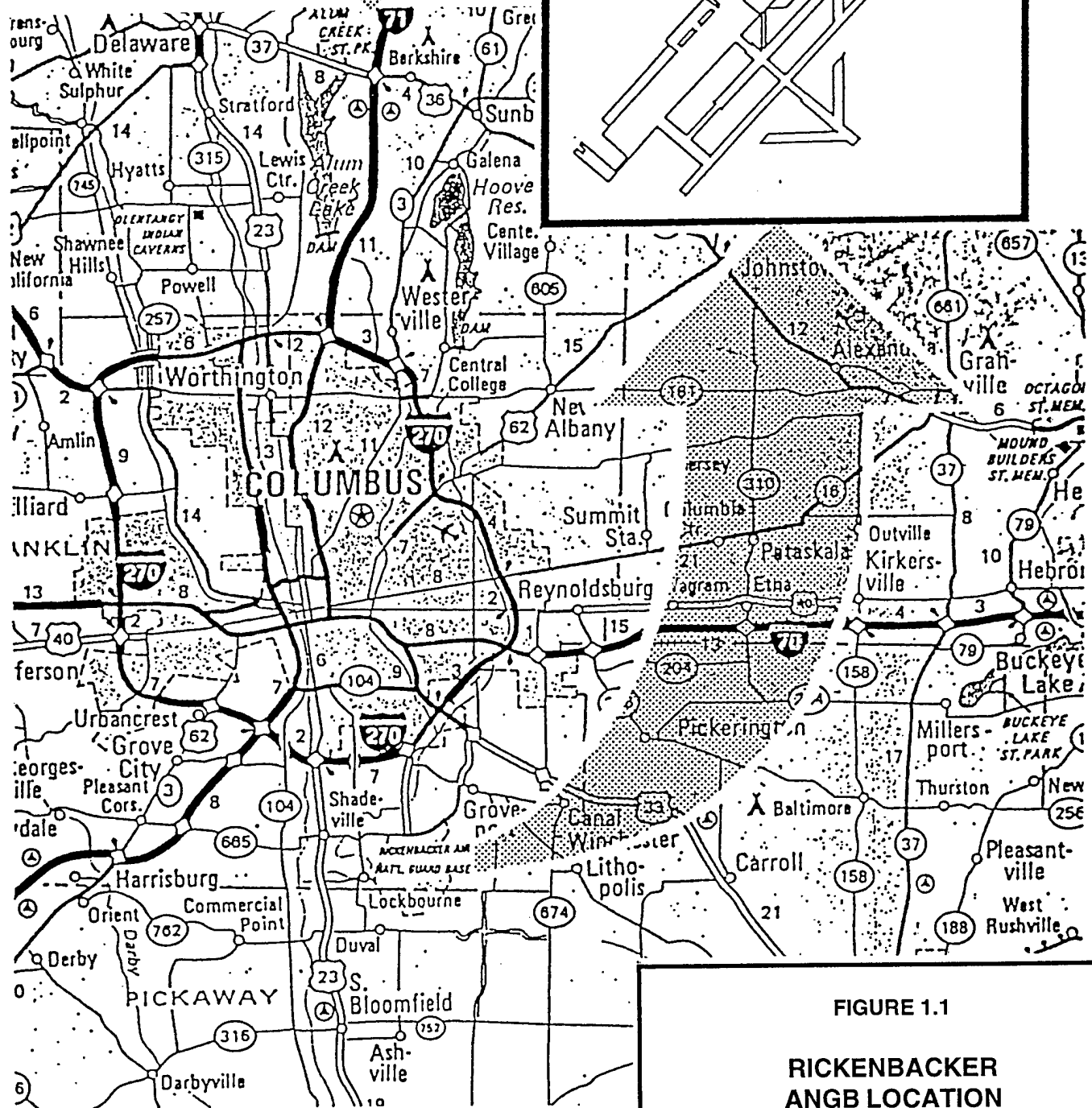
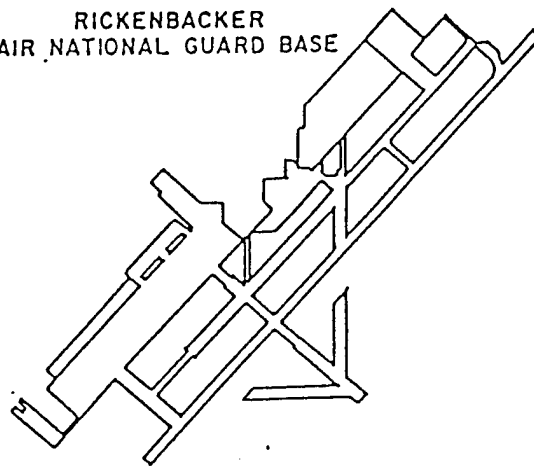
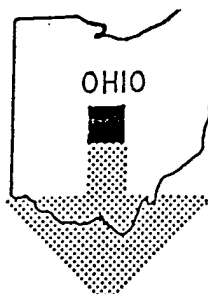
The environmental setting of the Base is described in the following subsections, with an emphasis on the identification of natural features that may influence the migration of hazardous-waste-related contaminants from the HWSA at Building 560.

1.3.1 Meteorology

The climate of Columbus, Ohio is continental, characterized by cold winters, hot summers, and moderate rainfall (Pierce, 1959). The mean annual temperature is 52 degrees Fahrenheit (°F). The coldest month is January, with a mean temperature of 30°F; the warmest month is July, with a mean temperature of 74°F. Precipitation at the Base falls primarily during the summer months, with June being the wettest month, and October being the driest month. The mean annual precipitation at the Base is 38 inches. The prevailing wind directions on the Base are from the southwest to north-northwest, as illustrated on Figure 1.2.

1.3.2 Regional Geology

The Base is located in the Glaciated Central Lowlands Province, just west of the Appalachian Plateau Province. The geology of the area is characterized by up to 200 feet of Pleistocene sandy and gravelly glacial outwash and silty and clayey glacial till filling a preglacial bedrock valley (Schmidt and Goldthwaite, 1958). Bedrock underlying the valley fill consists of Devonian-age limestones and shales of the Columbus and Delaware Formations.



RICKENBACKER ANGB LOCATION

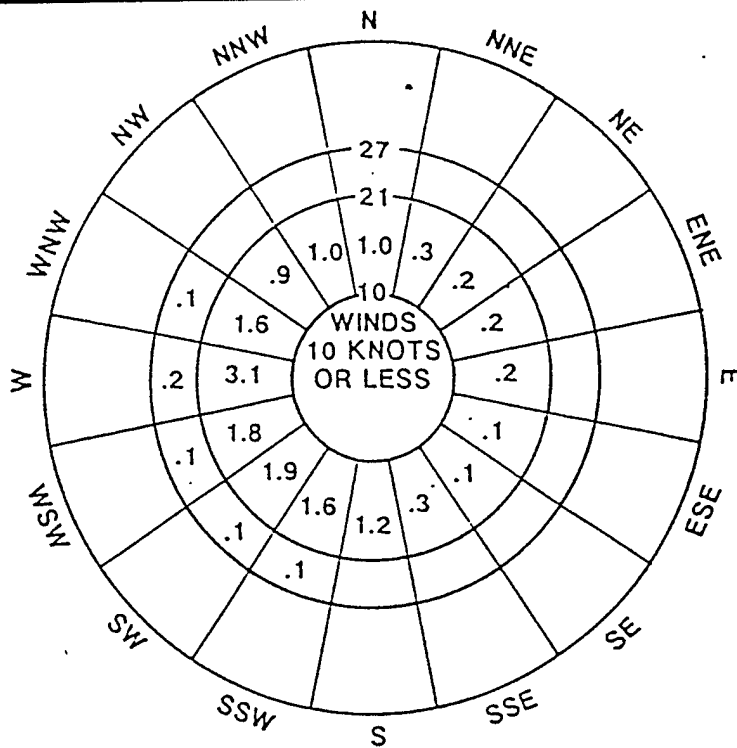
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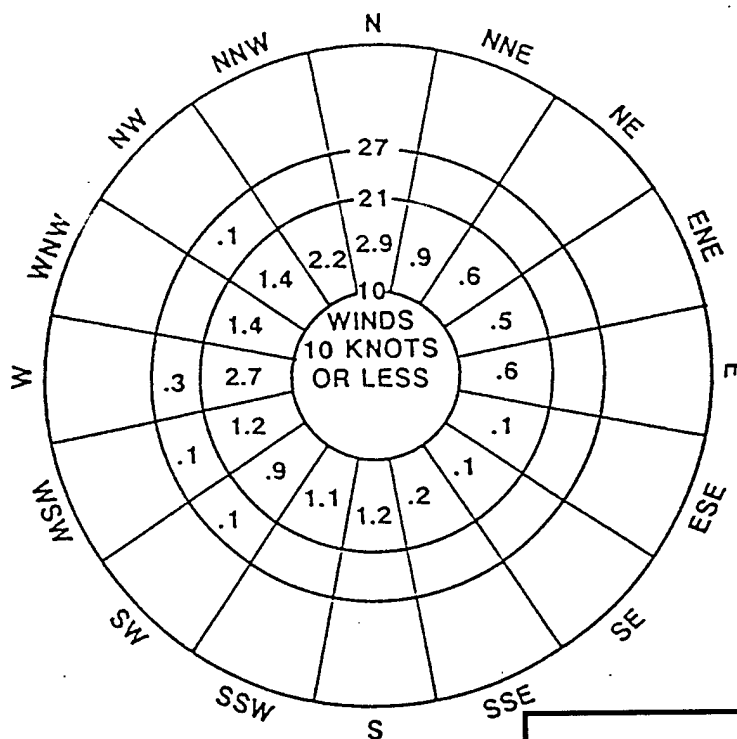
Denver, Colorado

Source: ES, 1992a.

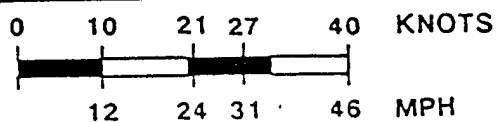
ALL WEATHER



INSTRUMENT



AIR FORCE RUNWAY WIND COMPUTER



NOTE THESE WIND ROSES SHOW THE TOTAL % OF WINDS BY SPEED GROUP AND DIRECTION BASED ON TRUE BEARING.

Source: ES, 1993.

FIGURE 1.2

**ANNUAL WIND ROSES
FOR THE BASE**

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The surficial geology at Rickenbacker ANGB is composed of two distinct glacial till deposits which overly glacial outwash deposits (IT, 1996a). The uppermost till, a Wisconsin-age ablation till, is composed primarily of a silty clay and a clayey silt with varying amounts of sand and gravel. The upper till unit grades in color from brown to gray with depth. The sand and gravel within this unit occur as isolated lenses that range in thickness from 3 to 30 feet (IT, 1996a). The second underlying till unit, a Wisconsin-age basal till, consists of gray silt with clay and contains varying amounts of fine sand and pebble gravel. This gray till is generally at least 10 feet thick (IT, 1996a). At the contact between the upper, brown to gray till and the lower gray till occur laterally discontinuous sand and gravel lenses.

1.3.3 Regional Soils

Soils mapped at the Base are of the Kokomo and Crosby Series (Soil Conservation Service, 1976). The soils are characterized as deep, very poorly drained, slowly to moderately slowly permeable soils formed in glacial tills on uplands. The Crosby series soils are formed on slopes with up to 6-percent grade, while the Kokomo series soils form on gentler 0- to 2-percent slopes on the higher landscape positions. The Crosby soils exhibit permeabilities of 0.06 to 0.6 inch per hour (in/hr) in unleached horizons. The Kokomo soils have permeabilities of 0.2 to 2.0 in/hr.

1.3.4 Regional Surface Water Hydrology

Rickenbacker ANGB occupies the drainage divide between Big Walnut Creek and Walnut Creek. Surface drainage from the Base is controlled through an extensive storm drain network, which includes corrugated metal and concrete drainage pipes and open, unlined drainage ditches. All of the surface runoff is routed through emergency interceptors before being released into surrounding surface streams, which ultimately discharge into Walnut Creek and Big Walnut Creek. Walnut Creek is the permanent stream nearest the HWSA and is located approximately 1.5 miles east of the site.

1.3.5 Regional Hydrology and Groundwater Use

The regional hydrologic regime is composed of three distinct water-bearing zones: an upper water-bearing zone (UWBZ), an intermediate aquifer, and a deep aquifer (IT, 1996a). The UWBZ occurs primarily in the laterally discontinuous sand and gravel lenses located at the contact between the two till units (Section 1.3.2). The heterogeneity of the UWBZ deposits creates localized unconfined/semiconfined hydraulic regimes with minimal hydraulic interconnection. The gray till, underlying the upper till and associated sand and gravel lenses, acts as an impermeable, lower boundary of the UWBZ. The UWBZ is hydraulically distinct and separate from the intermediate and deep aquifers (IT, 1995a).

Regionally, the intermediate and deep aquifers represent the primary potable water supply. Rickenbacker ANGB and RPA facilities receive water from the City of Columbus. In the nearby village of Lockbourne, most residents are supplied by the City of Columbus or have private wells screened in the intermediate aquifer (well depths range between 48 and 110 feet bgs). Five homeowners in Lockbourne are known to obtain their water supply from shallow, low-yielding wells ranging in depth from 20 to 30 feet bgs and assumed to be in the UWBZ (IT, 1996a). The UWBZ is not likely to be used in the future as a water supply due to the proximity of the much higher yielding intermediate and deep aquifers and historical problems in Lockbourne water, with bacteria and sewage disposal impacting shallow wells in the UWBZ (IT, 1996a).

SECTION 2

SITE DESCRIPTION

2.1 SITE BACKGROUND

The HWSA is located in the central area of the Base (Figure 2.1). The area where the HWSA was constructed had various other uses in the past. Historical aerial photographs, maps, and drawings indicate that the site was used as a storage yard, probably for drummed lube oils. When the Base was constructed in 1942, individual buildings were heated with coal. The coal storage area for the Base was located west of the HWSA, adjacent to the railroad tracks. The smokestack for a coal-burning furnace is still standing approximately 180 feet from the HWSA.

The HWSA measures 170 feet by 95 feet, and is surrounded by a chain-link fence with a locking gate (Figure 2.2). A majority of the site is unpaved and vegetated with grasses. There is a paved driveway that leads to the now-decontaminated Building 560, a slab-on-grade construction. The area surrounding the site is level and also is vegetated with grasses. To the north and east of the site is a gravel road, and beyond the road are railroad tracks that are no longer in use. The area to the south and west has been used in the recent past as a storage yard for stockpiled telephone poles and drummed nonhazardous material. To the south and east of the site are office buildings and parking lots. Farther east, the active Base runways are used by various military aircraft and private aircraft associated with the RPA.

Building 560 is a 15-foot-square pre-engineered metal structure with an adjacent 4-foot-square concrete drum wash pad. From 1974 to 1983, Building 560 (Figure 2.2) housed water demineralization equipment. Records indicate Buildings 551 and 552,

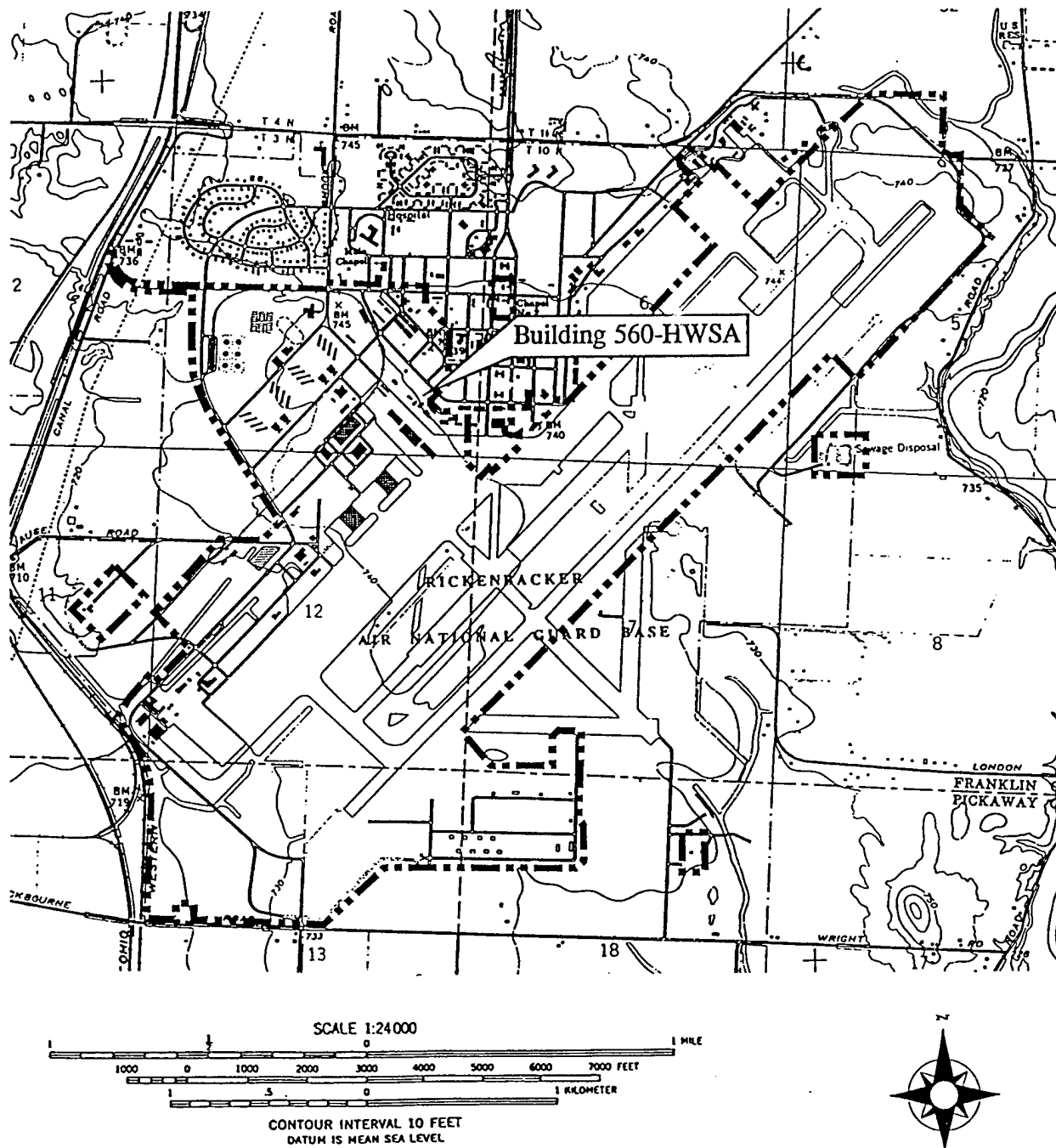


FIGURE 2.1

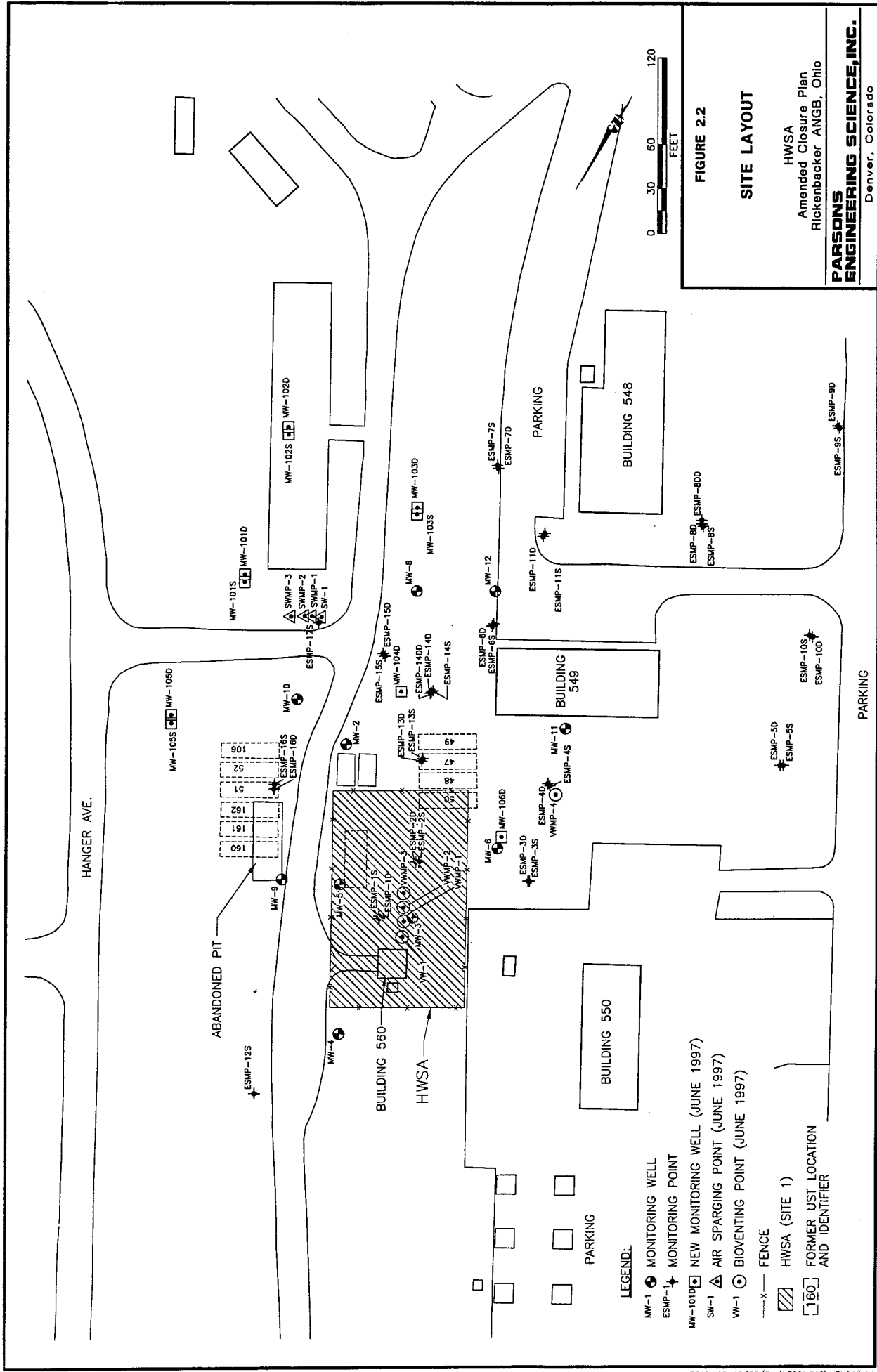
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Sources: USGS, 1985.



fuel pumping facilities, also were formerly located at this site. One of the buildings housed the valve controls for fuel hydrants used to off-load fuel from rail cars.

In 1983, the HWSA was used as a RCRA-permitted storage facility that received hazardous waste generated during Base activities, and was used for that purpose from 1983 to 1986. Building 560 was converted to a hazardous waste storage facility. The conversion included sealing all floor drains that led to storm sewers, connecting remaining drains to the sanitary sewer, and installing emergency eye-wash and shower fixtures. Wastes were containerized and brought to the site from other areas of the Base. Drum contents were characterized wastes for disposal or reuse and were then turned over to the Defense Property Disposal Office (DPDO) for disposal or recycling. The DPDO is now known as the Defense Reutilization and Materials Office (DRMO).

Building 560 was used to store small (5 gallons or less) containers that usually held acids or spent desiccants. Other materials stored at this site were containerized in 55-gallon drums that were stored outside the building within the fenced area. At any given time, as many as 165 containers were stored on pallets in the grassy area outside Building 560. Table 2.1 summarizes types and quantities of waste stored at the site from 1983 until 1986, when the HWSA was closed. Various chemical constituents likely to be present in some of these wastes have been detected in site soils and or groundwater (see Sections 3 and 4).

Additionally, five 12,000-gallon USTs (Tanks 53 through 57) and ten 25,000-gallon USTs (Tanks 47 through 52, 106, 160, 161, and 162) were previously located at or near the site. The former locations of the ten 25,000-gallon USTs are shown on Figure 2.2. The five former 12,000-gallon USTs were located approximately 700 feet north-northwest of Building 560. The four former USTs at the south corner of the site (Tanks 47 through 50) were used to store waste fuel, waste oil, and deicing fluid. The six former USTs located to the east of the site (Tanks 51, 52, 106, 160, 161, and 162) were used to store jet fuel, but were abandoned in 1964. Four of the former 12,000-gallon USTs were used to store diesel fuel and the fifth UST stored kerosene. These

TABLE 2.1
SUMMARY OF WASTE STORAGE
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Waste Description	USEPA Haz. Waste No.	Quantity (by year)			
		1983 (gal)	1984 (gal)	1985 (gal)	1986 (lb)
PD 680 (Stoddard Solvent, Flammable Aliphatic Petroleum Distillate)	D001	1,155	1,450	110	2,429
Carbon-Removing Compound (Methylene Chloride, Creosols, Phenols)	F001, F004	590	870	--	--
Highly Aromatic Naptha	D001	500	290	--	--
Methyl Ethyl Ketone	F005	285	525	--	1,050
Paint Remover	F005	200	540	--	--
Bromochloromethane	--	200	385	--	--
Sulfuric Acid	D002	25	25	--	--
Paint Thinner	D001	20	20	--	--
Ethanolamine and Benzyl Alcohol	D001	220	--	--	--
Oily Water and Cleaning Solutions Containing Lead, Cadmium, Chromium, and Nickel	D006, D007, D008	495	--	--	--
Hydraulic Fluid	--	0	360	--	--
Synthetic Oil	--	--	440	--	--
Inspection Penetrant	--	--	150	--	--
Organic Peroxide	D002	--	--	1	--
Spent Desiccant (Cobalt chloride) ^{a/}	--	50	40	10	--

^{a/} Quantities for desiccant for all years are shown in pounds.

five USTs were emptied and abandoned in 1981. All fifteen USTs were removed in 1994 and 1995 (Ogden Environmental and Energy Services, inc. [Ogden], 1995a and 1995b). AFBCA received NFRAP status from the Ohio Department of Commerce, Division of State Fire Marshal, BUSTR in March 1996 for Tanks #51 through 57, 106, 160, 161, and 162.

The NFRAP status for Tanks 47 through 50 excluded soil and groundwater, and was for the tanks only. Residual petroleum contamination in soils and groundwater associated with these four tanks is addressed in this amended closure plan.

2.2 PHYSICAL SETTING

2.2.1 Site Topography and Surface Hydrology

The site topography varies from approximately 740 to 742 feet above mean sea level (msl) (Figure 2.3). The site slopes gently to the east. No significant surface water drainages are present at the site.

2.2.2 Site Geology and Hydrogeology

Geologic cross sections were prepared for the HWSA using the lithologic descriptions from the soil borings and monitoring well borings and the results of cone penetrometer (CPT) testing. The cross section locations are shown in Figure 2.4, and the cross sections are in Figures 2.5 and 2.6.

Brown and gray silt and clay are present at HWSA from the surface to a depth of approximately 10 to 14 feet bgs. Within and beneath the uppermost silt and clay, sand and gravel lenses were encountered in most borings. The sand and gravel lenses appear to be locally continuous throughout the HWSA. However, these lenses are not laterally continuous across Rickenbacker ANGB, and represent localized hydraulic regimes (IT, 1996a). The sand and gravel lenses range in thickness from 8 feet in the northern part of the site to less than 5 feet in the central and southern portions of the site. The sand and gravel deposits at the site are underlain by the gray basal till, typically first encountered between 19 and 25 feet bgs. This clay unit acts as a barrier to vertical

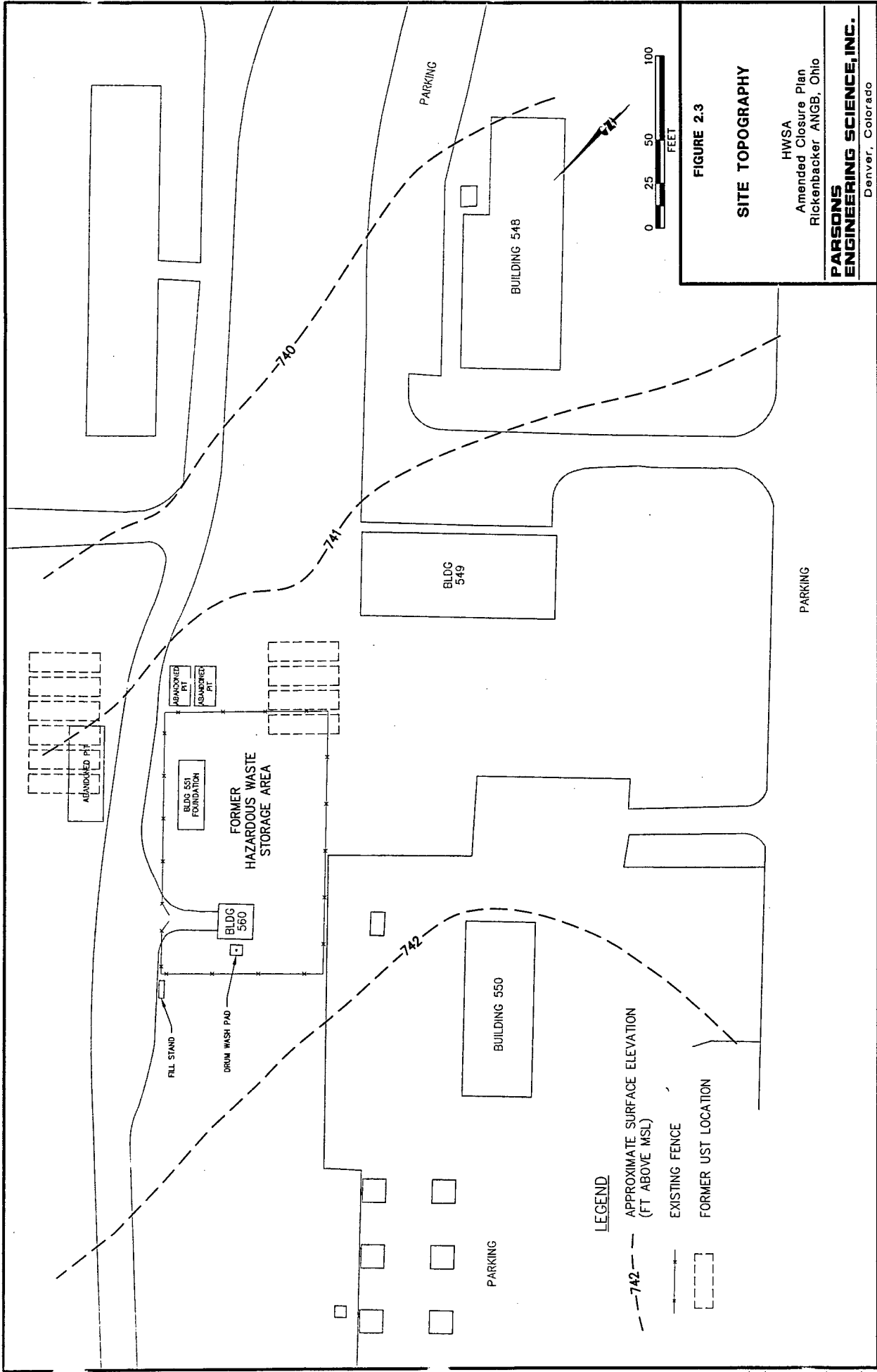
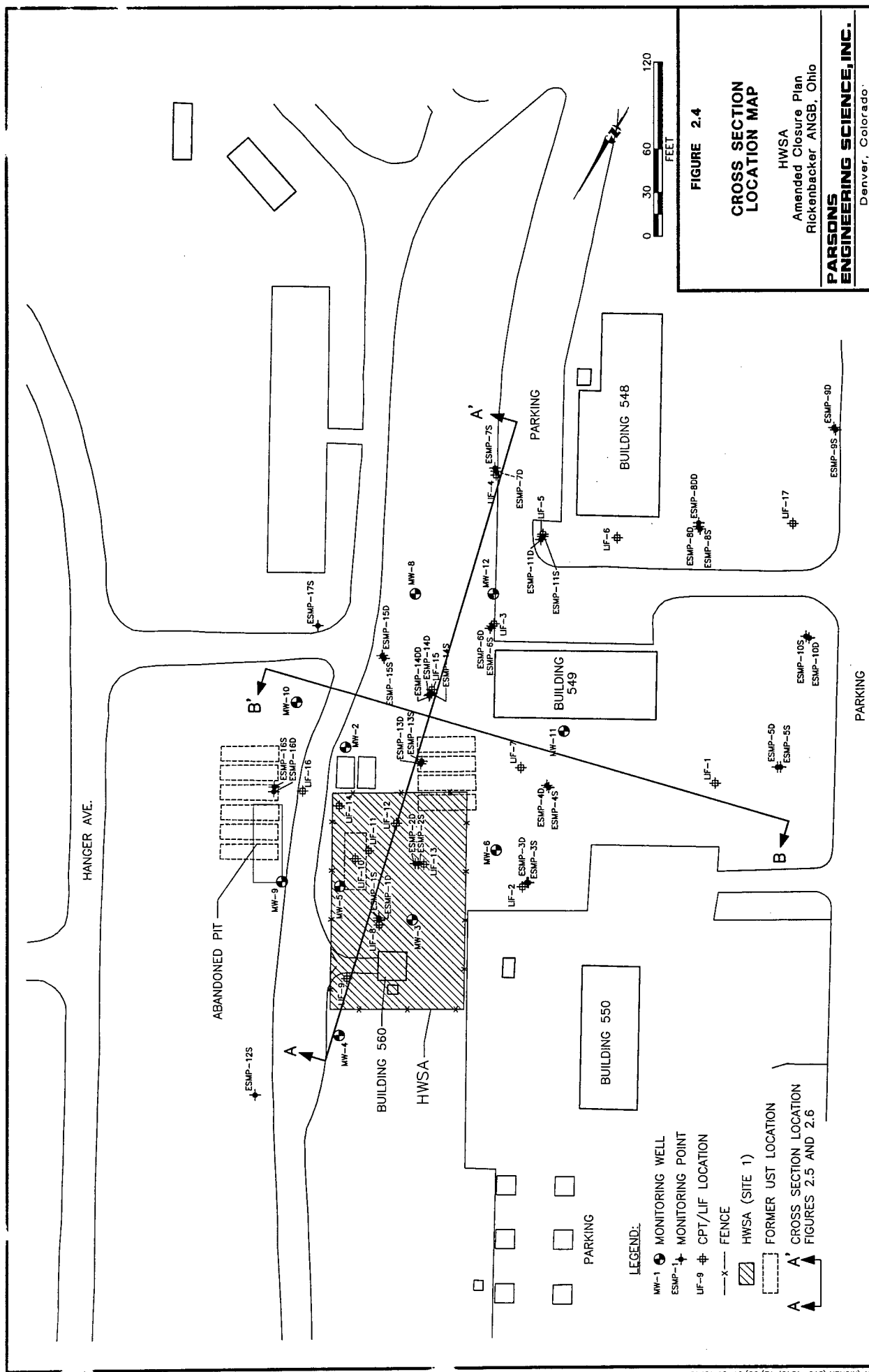


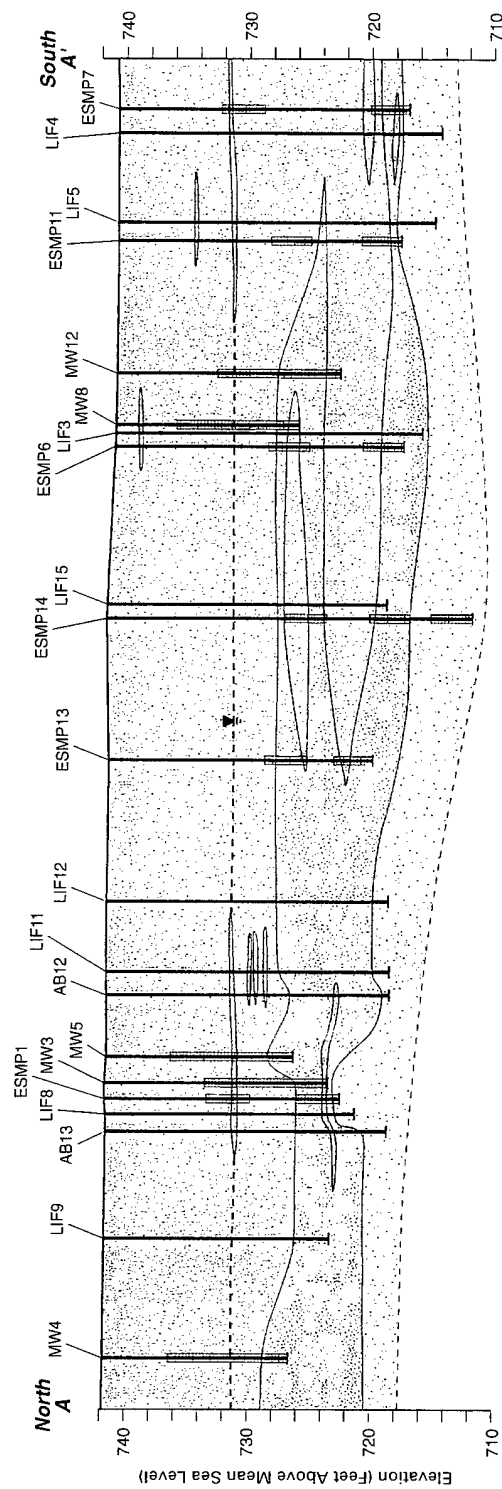
FIGURE 2.3

SITE TOPOGRAPHY

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Key

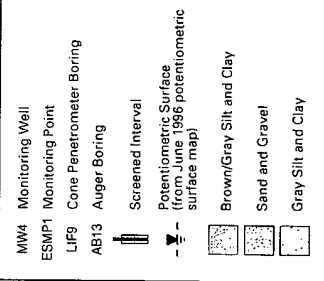


FIGURE 2.5

HYDROGEOLOGIC CROSS SECTION A-A'

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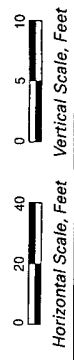
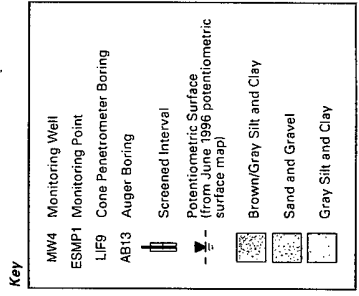
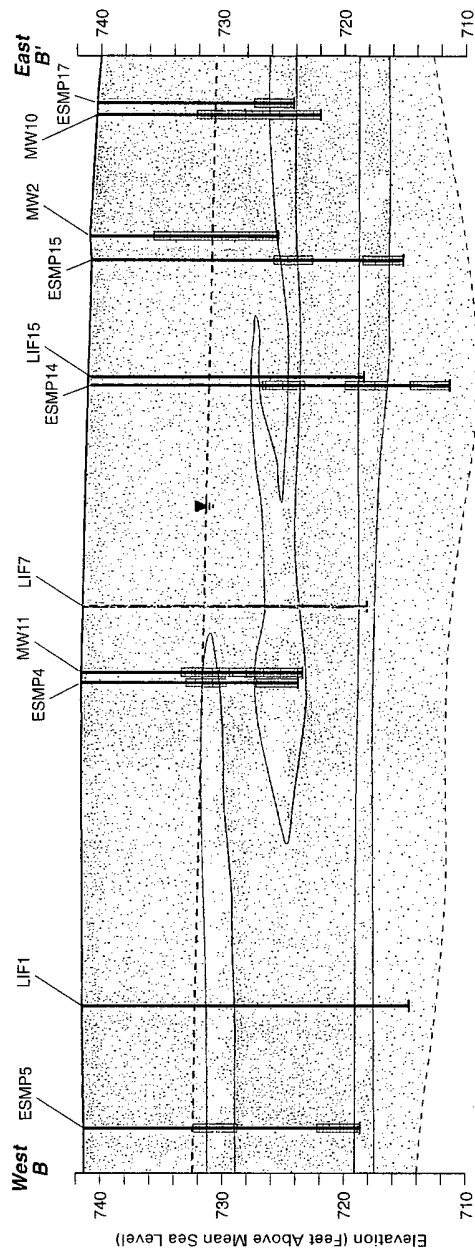


FIGURE 2.6
HYDROGEOLOGIC
CROSS SECTION B-B'

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migration of contaminants toward the intermediate and deep aquifers, which are used regionally for water supplies (Section 1.3.5).

The water level measurements and groundwater elevations from quarterly sampling events performed at the HWSA between August 1995 and March 1997 are presented in Table 2.2. These data indicated depths to shallow groundwater ranges between 8 and 12 feet bgs. Review of the potentiometric data indicate that there is generally a considerable difference (often more than 2 feet) in the groundwater elevation in adjacent monitoring point pairs screened at different depths within the UWBZ. The vertical gradient across the site is predominantly downward, though upward gradients also have been observed. The flow direction and horizontal gradient of shallow groundwater was determined using data from monitoring points screened in the same (laterally continuous) stratigraphic unit. Monitoring points ESMP-1D, 4D, 13S, 14S, and 17S are all screened in a sand zone encountered at a depth of approximately 14 feet bgs. Based on measurements from these monitoring points, Figure 2.7 and Figure 2.8 illustrate the potentiometric surface from the June 1996 and December 1996 sampling events, respectively. The groundwater flow direction within this sand lens is generally eastward, with a horizontal hydraulic gradient of approximately 0.0058 foot per foot (ft/ft), or approximately 1 foot change in elevation every 170 feet horizontally. The potentiometric surfaces illustrated on these figures are representative of the groundwater flow directions and gradients noted during other sampling events.

Hydraulic conductivities at the site were estimated from the rising head slug tests conducted in early 1995 (Parsons ES, 1997a); the test results are summarized in Table 2.3. Values for the hydraulic conductivity ranged from 0.13 foot per day (ft/day) to 2.79 ft/day. The average hydraulic conductivity at the HWSA, as determined from these tests, is 1.03 ft/day. Using a hydraulic gradient of 0.0058 ft/ft and assuming an effective porosity of 0.3, the estimated linear advective velocity of groundwater at the HWSA is 7.3 feet per year (ft/yr). IT (1997a) estimated linear groundwater velocities ranging from 4.97 ft/yr to 32.42 ft/yr based on 1996 data from monitoring wells screened in more than one hydrologic unit, and ranging from 5.85 ft/yr to 7.73 ft/yr

TABLE 2.2
GROUNDWATER ELEVATION DATA
AUGUST 1995 TO MARCH 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Datum Elevation (ft msl) ^{a/}	8/15/95		12/20/95		3/18/96		6/25/96	
		Depth to Water (ft) ^{b/}	Elevation (ft msl)	Depth to Water (ft)	Elevation (ft msl)	Depth to Water (ft)	Elevation (ft msl)	Depth to Water (ft)	Elevation (ft msl)
MW-02	743.36	12.14	731.22	13.23	730.13	11.26	732.10	12.00	731.36
MW-03	743.96	10.46	733.50	13.05	730.91	8.60	735.36	11.49	732.47
MW-04	745.15	11.38	733.77	13.26	731.89	9.86	735.29	11.81	733.34
MW-05	744.97	13.37	731.60	NA (free product)				13.11	731.86
MW-06	745.18	13.75	731.43			13.06	732.12	13.70	731.48
MW-08	743.89	10.53	733.36	12.94	730.95	8.43	735.46	11.28	732.61
MW-09	745.25	8.05	737.20	13.55	731.70			7.86	737.39
MW-10	742.64	11.23	731.41	12.30	730.34			11.06	731.58
MW-11	744.15	12.19	731.96	13.55	730.60	11.64	732.51	12.11	732.04
MW-12	743.02	13.10	729.92	13.71	729.31	11.98	731.04	12.28	730.74
ESMP-1S	741.67	7.43	734.24	9.44	732.23	5.65	736.02	8.28	733.39
ESMP-1D	741.72	10.17	731.55	10.56	731.16	8.87	732.85	10.00	731.72
ESMP-2S	741.18	3.57	737.61	5.83	735.35	1.73	739.45	4.38	736.80
ESMP-2D	741.29	6.18	735.11	10.10	731.19	8.55	732.74	9.64	731.65
ESMP-3S	742.23	7.68	734.55	11.26	730.97	7.82	734.41	8.94	733.29
ESMP-3D	742.22	10.69	731.53	11.92	730.30	9.94	732.28	10.55	731.67
ESMP-4S	742.70	5.94	736.76	9.92	732.78	6.92	735.78	10.62	732.08
ESMP-4D	742.69	11.15	731.54	12.23	730.46	10.42	732.27	10.93	731.76
ESMP-5S	741.51	3.83	737.68	6.89	734.62	3.46	738.05	4.87	736.64
ESMP-5D	741.56	6.20	735.36	9.00	732.56	2.07	739.49	7.10	734.46
ESMP-6S	740.98	10.79	730.19	NA				11.92	729.06
ESMP-6D	741.05	9.69	731.36	10.69	730.36	8.87	732.18	9.48	731.57
ESMP-7S	740.85	6.02	734.83	5.33	735.52	3.69	737.16	6.60	734.25
ESMP-7D	740.80	5.96	734.84	8.62	732.18	5.57	735.23	6.75	734.05
ESMP-8S	740.92	3.76	737.16	6.73	734.19	2.87	738.05	4.80	736.12
ESMP-8D	740.89	6.17	734.72	8.85	732.04			6.78	734.11
ESMP-8DD	740.83	7.38	733.45	9.58	731.25	7.07	733.76	7.84	732.99
ESMP-9S	741.79	3.38	738.41	5.22	736.57	1.46	740.33	5.14	736.65
ESMP-9D	741.70	6.53	735.17	9.35	732.35	6.27	735.43	7.36	734.34
ESMP-10S	741.56	6.15	735.41	10.03	731.53	7.26	734.30	8.00	733.56
ESMP-10D	741.54	6.41	735.13	9.22	732.32	6.28	735.26	7.22	734.32
ESMP-11S	740.76	6.66	734.10	7.15	733.61	6.42	734.34	7.06	733.70
ESMP-11D	740.80	7.11	733.69	9.04	731.76	6.69	734.11	7.52	733.28
ESMP-12S	742.43	2.57	739.86	6.23	736.20	0.40	742.03	4.21	738.22
ESMP-13S	741.38	10.34	731.04	10.90	730.48	9.34	732.04	10.04	731.34
ESMP-13D	741.38	10.06	731.32	10.56	730.82	9.10	732.28	9.90	731.48
ESMP-14S	741.17	10.13	731.04	10.31	730.86	9.16	732.01	9.84	731.33
ESMP-14D	741.18	9.89	731.29	10.37	730.81	8.92	732.26	9.66	731.52
ESMP-14DD	741.13	9.72	731.41	10.56	730.57	8.93	732.20	9.42	731.71
ESMP-15S	740.37	9.45	730.92	9.68	730.69	8.47	731.90	9.25	731.12
ESMP-15D	740.28	8.98	731.30	9.45	730.83	7.98	732.30	8.80	731.48
ESMP-16S	740.33	8.00	732.33	9.60	730.73	7.78	732.55	8.36	731.97
ESMP-16D	740.33	8.77	731.56	9.18	731.15	7.87	732.46	8.62	731.71
ESMP-17S	739.87	9.19	730.68	9.56	730.31	8.52	731.35	9.19	730.68

TABLE 2.2 (Continued)
GROUNDWATER ELEVATION DATA
AUGUST 1995 TO MARCH 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Datum Elevation (ft msl) ^{a/}	9/23/96		12/2/96		3/18/97	
		Depth to Water (ft)	Elevation (ft msl)	Depth to Water (ft)	Elevation (ft msl)	Depth to Water (ft)	Elevation (ft msl)
MW-02	743.36	15.37	727.99	10.63	732.73	10.39	732.97
MW-03	743.96	15.47	728.49	10.44	733.52	9.18	734.78
MW-04	745.15	16.00	729.15	10.30	734.85	9.69	735.46
MW-05	744.97	13.92	731.05			11.67	733.30
MW-06	745.18	17.12	728.06	12.28	732.90	12.08	733.10
MW-08	743.89	15.78	728.11	8.36	735.53	7.91	735.98
MW-09	745.25						
MW-10	742.64						
MW-11	744.15	15.60	728.55	10.95	733.20	10.78	733.37
MW-12	743.02	15.07	727.95	10.32	732.70	10.39	732.63
ESMP-1S	741.67						
ESMP-1D	741.72						
ESMP-2S	741.18						
ESMP-2D	741.29	10.07	731.22	8.30	732.99	8.00	733.29
ESMP-3S	742.23						
ESMP-3D	742.22	10.96	731.26	9.15	733.07	8.93	733.29
ESMP-4S	742.70	11.08	731.62	9.47	733.23	9.54	733.16
ESMP-4D	742.69	11.33	731.36	9.52	733.17	9.44	733.25
ESMP-5S	741.51						
ESMP-5D	741.56						
ESMP-6S	740.98						
ESMP-6D	741.05	9.86	731.19	8.06	732.99	7.83	733.22
ESMP-7S	740.85						
ESMP-7D	740.80						
ESMP-8S	740.92	6.80	734.12	4.18	736.74	3.33	737.59
ESMP-8D	740.89						
ESMP-8DD	740.83						
ESMP-9S	741.79						
ESMP-9D	741.70						
ESMP-10S	741.56	9.96	731.60	8.29	733.27	7.38	734.18
ESMP-10D	741.54						
ESMP-11S	740.76						
ESMP-11D	740.80						
ESMP-12S	742.43						
ESMP-13S	741.38	10.36	731.02	8.64	732.74	8.38	733.00
ESMP-13D	741.38						
ESMP-14S	741.17						
ESMP-14D	741.18	10.13	731.05	8.29	732.89	8.01	733.17
ESMP-14DD	741.13						
ESMP-15S	740.37						
ESMP-15D	740.28						
ESMP-16S	740.33	9.11	731.22	7.18	733.15	6.51	733.82
ESMP-16D	740.33	9.07	731.26	7.27	733.06	6.94	733.39
ESMP-17S	739.87	9.41	730.46	7.87	732.00	7.81	732.06

Note: Blank spaces indicate water level not measured during this sampling event.

^{a/} ft msl = Feet above mean sea level.

^{b/} Feet below top of well casing.

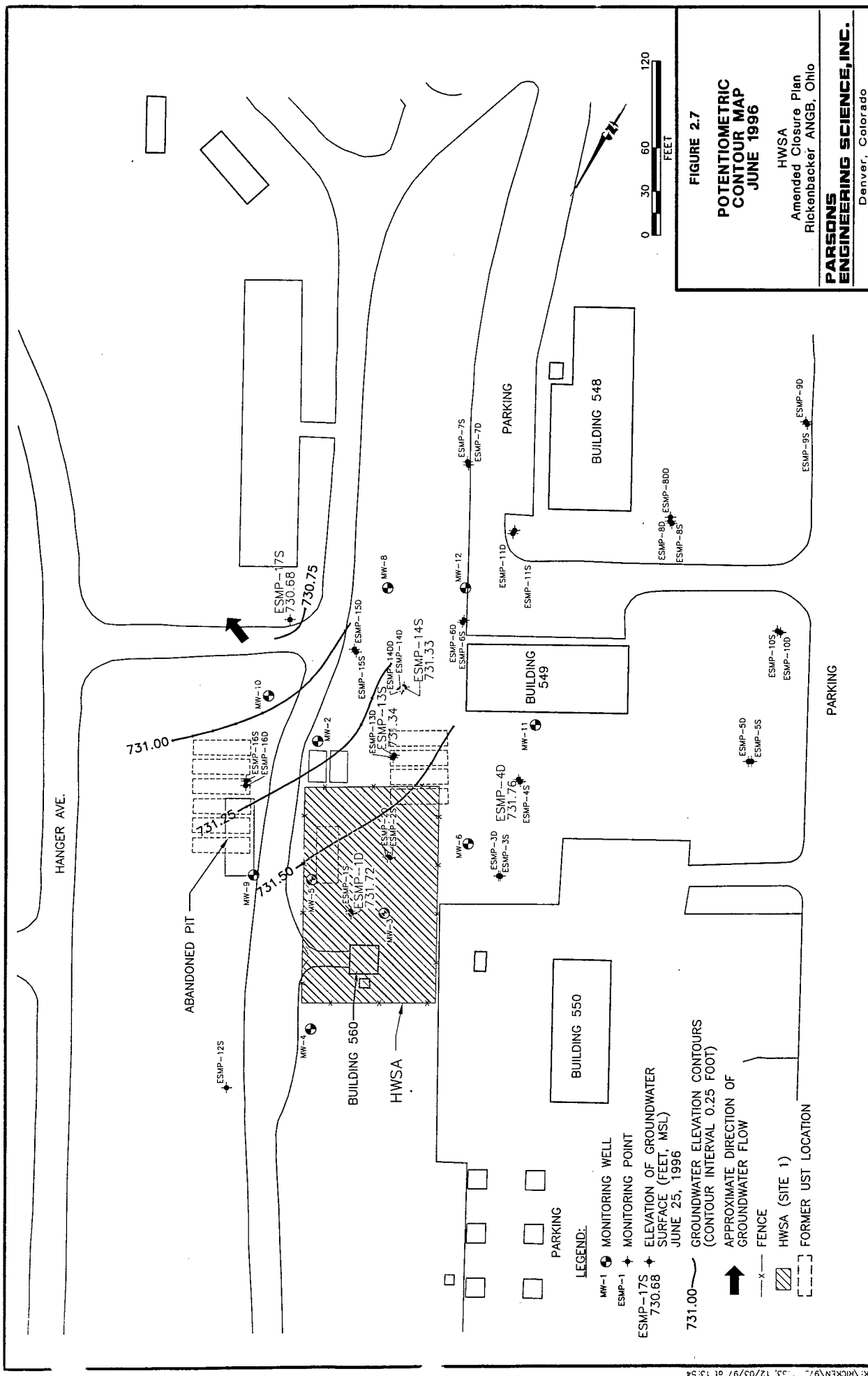


FIGURE 2.7

**POTENTIOMETRIC
CONTOUR MAP
JUNE 1996**

HWSA
Amended Closure Plan
Rickenbacker ANGB, Ohio

**PARSONS
ENGINEERING SCIENCE, INC.**

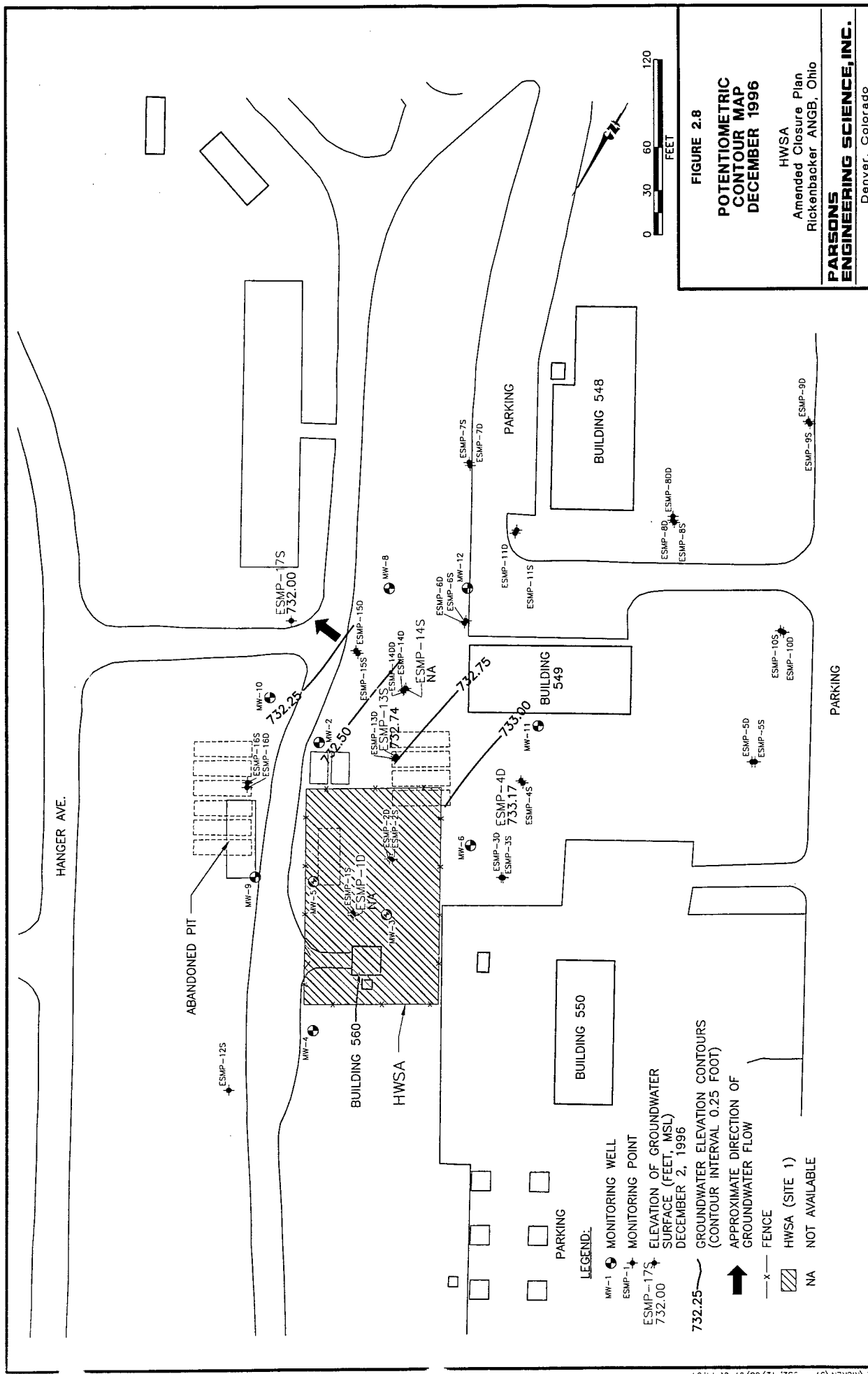


FIGURE 2.8

POTENTIOMETRIC CONTOUR MAP

DECEMBER 1996

HWSA
Amended Closure Plan
Rickenbacker ANGB, Ohio

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

TABLE 2.3
HYDRAULIC CONDUCTIVITY (K) VALUES FROM SLUG TESTS, MARCH 1995
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well	K (ft/min)	K (ft/day)
MW-4	5.23E-04	0.75
MW-4	4.59E-04	0.66
MW-6	1.94E-03	2.79
MW-6	9.01E-04	1.30
MW-9	8.77E-04	1.26
MW-9	6.56E-04	0.94
MW-12	9.88E-05	0.14
MW-12	8.98E-05	0.13
Average K	7.17E-04	1.03
Minimum K	8.98E-05	0.13
Maximum K	1.94E-03	2.79

based on monitoring points screened in the sand seam. Due to the heterogeneity of the unconsolidated deposits at the site, the advective flow velocity calculated for the sand seam is assumed to represent the most reliable estimate of advective velocity in the vicinity of the HWSA (IT, 1997a). Advective velocities for the site based on additional assessment activities conducted in 1997 are reviewed in Section 4.1.2.1.

2.3 LAND USE

2.3.1 Site Access

The HWSA is centrally located within Rickenbacker ANGB (Figure 2.1). Access to Rickenbacker ANGB is restricted by a chain-link fence surrounding the Base and by security personnel stationed at the Base entrance 24 hours a day. Active flying missions by military aircraft, as well as other ongoing and proposed private/commercial flying activities, ensure that access to the facility will continue to be restricted. The inactive HWSA is surrounded by a 6-foot-high chain-link fence with a locked gate (Figure 2.2).

2.3.2 Current Land Use

Currently, the HWSA is an inactive, interim-status RCRA facility. The site area and the surrounding area within a 150-foot radius, have not been used for any purpose since the 1995 removal of the four USTs in the southern corner of the site (Figure 2.2). Use of surrounding Rickenbacker ANGB facilities also has been limited because of Base closure/conversion activities initiated by the Department of Defense (DOD) in the mid-1980s. Buildings 548, 549, and 550, to the south and west of the HWSA, are unoccupied. Hangars used for airfield support, located approximately 500 feet to the south and west of the site, represent the closest, routinely used Rickenbacker ANGB facilities.

Off-Base land usage closest to the site is commercial/industrial in nature. The RPA owns property to the north and east of the HWSA across Hangar Avenue (Figure 2.2). RPA land adjacent to Hangar Avenue is undeveloped. The closest occupied RPA-

owned facilities are located more than 500 feet from the HWSA, and are leased for commercial use. Active base runways are located approximately 1,000 feet east and south of the HWSA, and the eastern and southern Base boundaries are located approximately 1.3 miles and 2 miles from the site, respectively.

RPA and Rickenbacker ANGB obtain their water supply from the city of Columbus (see Section 1.3.5). None of the former water supply wells at the Base are used. The active water supply wells closest to the HWSA and screened in the UWBZ are located in the village of Lockbourne approximately 1.5 miles to the southwest.

2.3.3 Proposed Land Use

The proposed future use of the HWSA and surrounding property is industrial/commercial in nature. In July 1997, the RPA submitted a concept plan for redevelopment of the HWSA and surrounding area to the Federal Aviation Administration (FAA). The concept plan was approved by the FAA in September 1997. Under the plan, the HWSA property and all property within 700 to 800 feet of the site will be used for airfield support. The HWSA and areas to the northwest and southeast, including the aircraft runways are included in Parcel D1, which is planned for development under Phase I of the concept plan (see Appendix A). A concrete aircraft and aircraft support equipment access taxiway is planned for installation over the site. Buildings in the immediate vicinity of the HWSA, including Building 560, will be demolished as part of the Phase I development. The existing aircraft hangars south and west of the HWSA are expected to remain in place.

SECTION 3

PREVIOUS SITE INVESTIGATIONS AND REMEDIATION ACTIVITIES

Preliminary environmental investigations were conducted at the HWSA in 1988 (ES, 1990), 1990 (ES, 1992a), and 1991 (ES, 1992b). Additional fieldwork was conducted in February and March 1995 to evaluate the potential for naturally occurring chemical attenuation processes to effect *in situ* remediation of dissolved contamination at the HWSA (Parsons ES, 1995a and 1995b, and 1997a). Supplemental data were collected during subsequent groundwater sampling events between August 1995 and December 1996 (IT, 1995b, 1996b, 1997a, and 1997b) and remediation activities pursuant to site closure which were conducted at the HWSA in 1995 and 1996 (Ogden, 1995a and 1995b; Parsons ES, 1996). The activities conducted during these investigations are summarized in this section, and supporting data are presented in Appendices B and D. Analytical results are reviewed in Section 4.

3.1 PREVIOUS INVESTIGATIONS

3.1.1 Pre-Closure Sampling

During the investigations conducted from 1988 through 1991, surface soil, subsurface soil, soil gas, and groundwater samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. The analytes targeted in these sampling efforts are listed in Table 3.1. A total of 15 boreholes were completed, 12 monitoring wells were installed, and numerous soil, soil gas, and groundwater samples were collected during pre-closure sampling activities (ES, 1990, 1992a, and 1992b). The borings (including wells) ranged in depth from 10 to 27 feet bgs (Table 3.2).

TABLE 3.1
LIST OF TARGET ANALYTES FOR PREVIOUS INVESTIGATIONS (1988-1991)
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Base/Neutral Extractable Semivolatile Organic Compounds (USEPA Method SW 8270)	
Acenaphthene	Fluoranthene
Acenaphthylene	Fluorene
Anthracene	
	Hexachlorobenzene
Benzo(b)fluoranthene	Hexachlorobutadiene
Benzo(k)fluoranthene	Hexachloroethane
Benzo(a)pyrene	Hexachlorocyclopentadiene
Benzo(a)anthracene	
Benzo(ghi)perylene	Indeno(1,2,3-cd)pyrene
Benyl Alcohol *	Isophorone
Bis(2-chloroethyl)ether	
Bis(2-chloroethoxy)methane	Naphthalene
Bis(2-ethylhexyl)phthalate	Nitrobenzene
Bis(2-chloroisopropyl)ether	N-Nitrosodiphenylamine
4-Bromophenyl phenyl ether	2-Nitroaniline
Butylbenzophthalate	3-Nitroaniline
	4-Nitroaniline
2-Chloronaphthalene	N-Nitroso-Dimethylamine *
4-Chloroaniline	N-Nitroso-di-n-diopropylamine
4-Chlorophenyl phenyl ether	
Chrysene	2-Methylnaphthalene
Dibenzo(a,h)anthracene	Phenanthrene
Dibenzofuran	Pyrene
Di-n-octylphthalate	
1,3-Dichlorobenzene	1,2,4-Trichlorobenzene
1,2-Dichlorobenzene	
1,4-Dichlorobenzene	
3,3'-Dichlorobenzidine	
Diethyl phthalate	
Dimethyl phthalate	
2,4-Dinitrotoluene	
2,6-Dinitrotoluene	
Di-n-octylphthalate	

TABLE 3.1 (CONTINUED)
LIST OF TARGET ANALYTES FOR PREVIOUS INVESTIGATIONS (1988-1991)
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Volatile Organic Compounds (USEPA Methods SW 8240/8260)	
Acrolein *	1,2-Dichloroethane
Acetone	trans-1,2-Dichloroethene
Acrylonitrile *	trans-1,3-Dichloropropene
Benzene	Ethylbenzene
Bromomethane	2-Hexanone
Bromodichloromethane	Methylene Chloride
Bromoform	4-Methyl-2-pentanone
2-Butanone	Styrene
Carbon disulfide	1,1,2,2-Tetrachloroethane
Carbon tetrachloride	Tetrachloroethene
Chlorobenzene	Toluene
Chloroethane	1,1,1-Trichloroethane
Chloroform	1,1,2-Trichloroethane
2-Chloroethyl vinyl ether *	Trichloroethene
Chloromethane	Trichlorofluoromethane *
Dibromochloromethane	Vinyl chloride
1,2-Dichloropropane	Vinyl Acetate *
1,3-Dichlorobenzene *	Xylenes
cis-1,3-Dichloropropene	
1,2-Dichlorobenzene *	
1,4-Dichlorobenzene *	
1,1-Dichloroethene	

Metals (USEPA Methods SW6010 and SW7470/7471)	
Antimony	Mercury
Arsenic	Nickel
Beryllium	Selenium
Cadmium	Silver
Chromium	Thallium
Copper	Zinc
Lead	

* These compounds were not on the Target Compound List (TCL) for the method, but were included in the laboratory report.

TABLE 3.2
MONITORING POINT AND WELL COMPLETION DETAILS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Location	Installation Date	Easting	Northing	Datum Elevation ^a (ft msl)	Ground Elevation (ft msl)	PVC Casing ID (inches)	Screen Length (feet)	Total Depth ^b (ft btoc)	Depth to Top of Screen (ft btoc)	Depth to Base of Screen (ft btoc)
ESMP-1S	2/23/95	1845016	662614	741.67	741.60	0.50	3.28	11.70	8.42	11.70
ESMP-1D	2/23/95	1845015	662615	741.72	741.60	0.50	3.28	18.80	15.52	18.80
ESMP-2S	2/23/95	1845023	662568	741.18	741.20	0.50	3.28	11.42	8.14	11.42
ESMP-2D	2/23/95	1845025	662569	741.29	741.20	0.50	3.28	22.50	19.22	22.50
ESMP-3S	2/23/95	1844958	662524	742.23	741.80	0.50	3.28	12.55	9.27	12.55
ESMP-3D	2/23/95	1844959	662526	742.22	741.80	0.50	3.28	22.19	18.91	22.19
ESMP-4S	2/23/95	1844996	662467	742.70	742.60	0.50	3.28	12.58	9.30	12.58
ESMP-4D	2/23/95	1844997	662467	742.69	742.60	0.50	3.28	18.44	15.16	18.44
ESMP-5S	2/23/95	1844891	662345	741.51	741.50	0.50	3.28	12.51	9.23	12.51
ESMP-5D	2/23/95	1844893	662346	741.56	741.50	0.50	3.28	22.54	19.26	22.54
ESMP-6S	2/23/95	1845105	662411	740.98	741.00	0.50	3.28	15.80	12.52	15.80
ESMP-6D	2/23/95	1845105	662412	741.05	741.00	0.50	3.28	23.51	20.23	23.51
ESMP-7S	2/23/95	1845181	662330	740.85	740.80	0.50	3.28	11.75	8.47	11.75
ESMP-7D	2/23/95	1845179	662331	740.80	740.80	0.50	3.28	23.59	20.31	23.59
ESMP-8S	2/23/95	1845049	662261	740.92	740.80	0.50	3.28	10.72	7.44	10.72
ESMP-8D	2/23/95	1845050	662261	740.89	740.90	0.50	3.28	22.81	19.53	22.81
ESMP-8DD	2/23/95	1845052	662259	740.83	740.80	0.50	3.28	29.74	26.46	29.74
ESMP-9S	2/23/95	1845034	662143	741.79	741.60	0.50	3.28	11.81	8.53	11.81
ESMP-9D	2/23/95	1845036	662143	741.70	741.60	0.50	3.28	21.85	18.57	21.85
ESMP-10S	2/23/95	1844945	662265	741.56	741.50	0.50	3.28	15.84	12.56	15.84
ESMP-10D	2/23/95	1844942	662265	741.54	741.50	0.50	3.28	22.07	18.79	22.07
ESMP-11S	2/23/95	1845124	662341	740.76	740.80	0.50	3.28	15.78	12.50	15.78
ESMP-11D	2/23/95	1845123	662343	740.80	740.80	0.50	3.28	22.82	19.54	22.82
ESMP-12S	2/24/95	1844991	662762	741.43	741.30	0.50	3.28	15.73	12.45	15.73

TABLE 3.2 (Continued)
MONITORING POINT AND WELL COMPLETION DETAILS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Location	Installation Date	Easting	Northing	Datum Elevation ^a (ft msl)	Ground Elevation (ft msl)	PVC Casing ID (inches)	Screen Length (feet)	Total Depth ^b (ft btoc)	Depth to Top of Screen (ft btoc)	Depth to Base of Screen (ft btoc)
ESMP-13S	2/24/95	1845072	662515	741.38	741.40	0.50	3.28	16.18	12.90	16.18
ESMP-13D	2/24/95	1845071	662515	741.38	741.40	0.50	3.28	21.48	18.20	21.48
ESMP-14S	2/24/95	1845102	662475	741.17	741.40	0.50	3.28	17.70	14.42	17.70
ESMP-14D	2/24/95	1845103	662474	741.18	741.00	0.50	3.28	24.58	21.30	24.58
ESMP-14DD	2/24/95	1845103	662476	741.13	741.00	0.50	3.28	29.71	26.43	29.71
ESMP-15S	2/24/95	1845143	662479	740.37	740.20	0.50	3.28	17.52	14.24	17.52
ESMP-15D	2/24/95	1845145	662478	740.28	740.20	0.50	3.28	24.90	21.62	24.90
ESMP-16S	2/24/95	1845132	662598	740.33	740.30	0.50	3.28	15.57	12.29	15.57
ESMP-16D	2/24/95	1845130	662601	740.33	740.30	0.50	3.28	22.65	19.37	22.65
ESMP-17S	2/24/95	1845192	662495	739.87	739.90	0.50	3.28	15.62	12.34	15.62
MW-2	7/29/88	1845118	662544	743.36	741.10	2	10	16.91	6.91	16.91
MW-3	8/10/88	1844999	662599	743.96	741.60	2	10	20.10	10.10	20.10
MW-4	1/29/90	1844979	662691	745.15	741.80	2	10	18.30	8.30	18.30
MW-5	1/31/90	1845051	662617	744.97	741.60	2	10	18.04	8.04	18.04
MW-6	1/30/90	1844991	662524	745.18	741.70	2	10	17.99	7.99	17.99
MW-8	1/30/90	1845159	662431	743.89	740.40	2	10	18.44	8.44	18.44
MW-9	2/9/90	1845083	662643	745.25	741.60	2	10	18.27	8.27	18.27
MW-10	10/14/91	1845165	662544	742.64	740.30	2	10	20.16	10.16	20.16
MW-11	10/15/91	1845017	662429	744.15	741.40	2	10	19.77	9.77	19.77
MW-12	10/15/91	1845120	662394	743.02	740.80	2	10	20.06	10.06	20.06

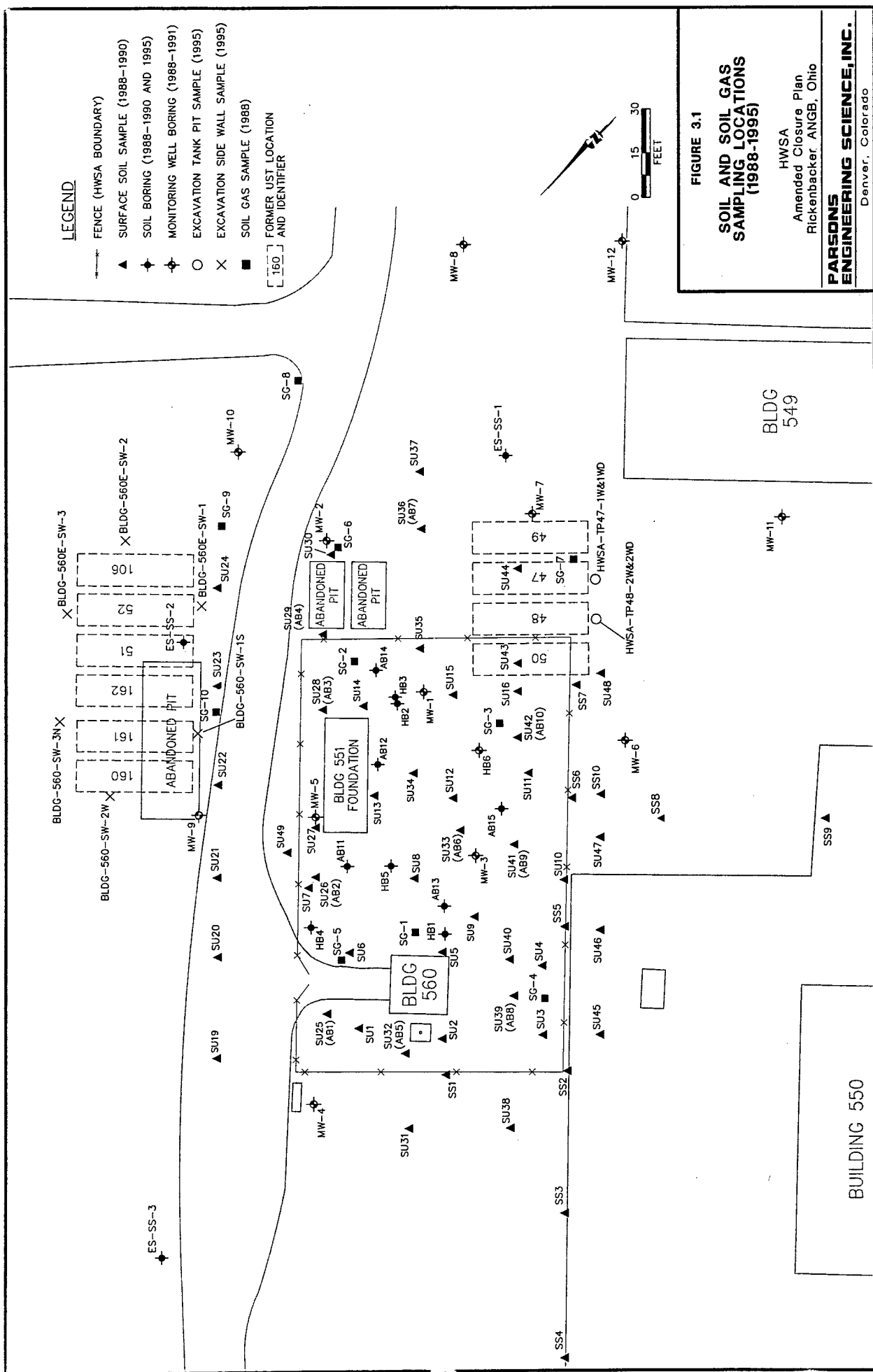
^a ft msl = feet above mean sea level.

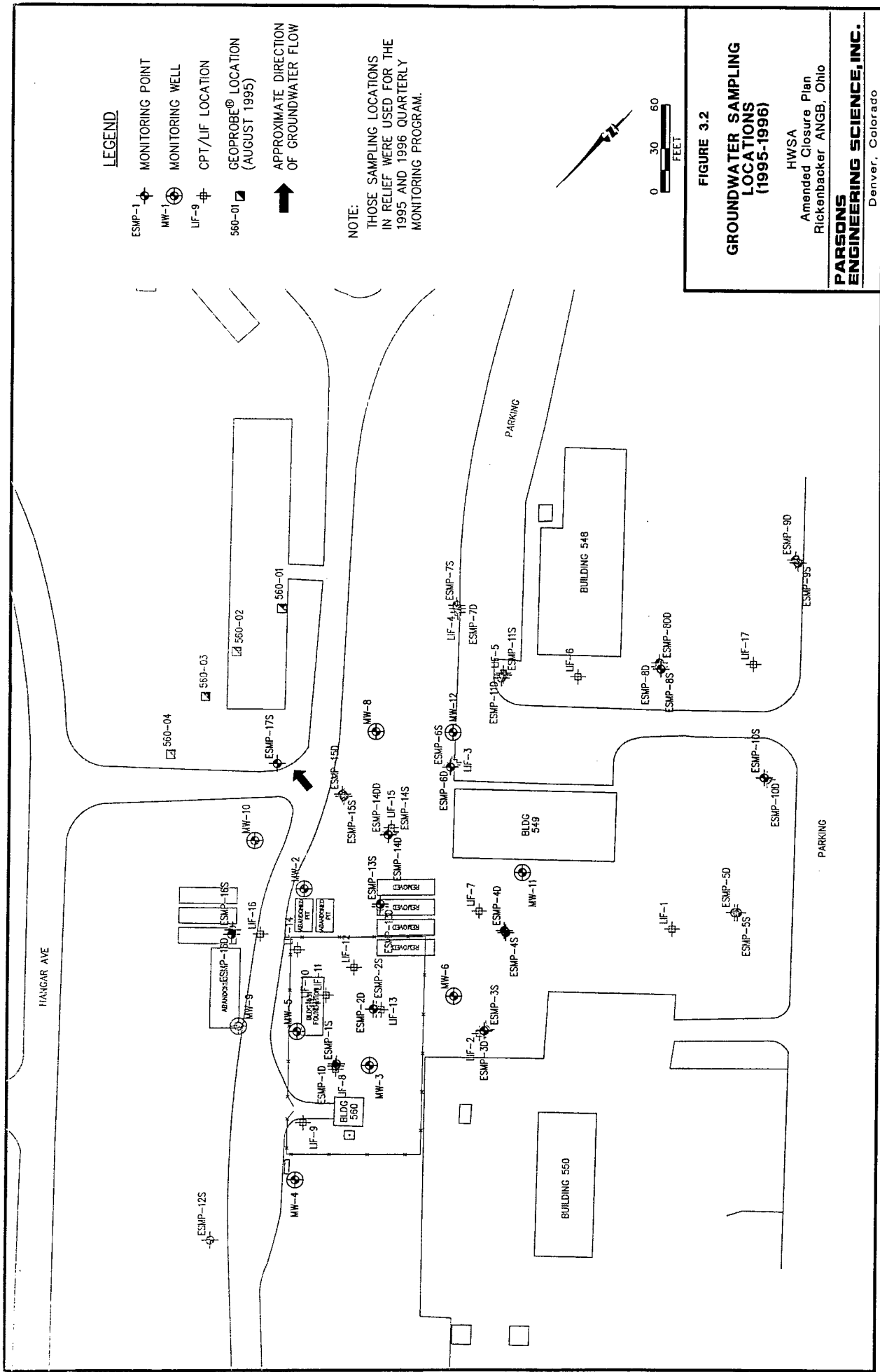
^b ft btoc = feet below top of casing.

Soil and soil gas sampling locations from these investigations as well as from the 1995 site investigations are shown on Figure 3.1. The sampling results indicated residual VOC, SVOC, and metals contaminants in site soils, and dissolved in groundwater. The analytical results from the investigations conducted prior to 1995 are compiled in tables included in Appendix B. These data, combined with data collected during 1997 additional assessment activities at the HWSA, are used in Section 4.2 to describe the nature and extent of contamination at the site.

3.1.2 Parsons ES Natural Chemical Attenuation Investigation

In February/March 1995, personnel from Parsons ES, US Army Corps of Engineers (USACE), and the USEPA National Risk Management Research Laboratory (NRMRL, formerly the Robert S. Kerr Environmental Research Laboratory) performed RNA sampling to determine if natural chemical attenuation processes were occurring at the HWSA, and if so, to evaluate if these processes can play a significant role in groundwater remediation. Additional data were collected to evaluate near-surface geology, aquifer properties, and the nature and extent of soil and groundwater contamination at the site. Site characterization activities included performing CPT with laser-induced fluorescence (LIF); sampling and analyzing soils from CPT pushes; installing groundwater monitoring points; sampling and analyzing groundwater from the monitoring points and previously installed monitoring wells; and measuring and estimating hydrogeologic parameters of the UWBZ (static groundwater levels, groundwater gradient, groundwater flow direction, and hydraulic conductivity). The field methods for all site activities are described in the *Draft Work Plan for a Treatability Study in Support of the Intrinsic Remediation (Natural Attenuation) Option at Site 1 (Hazardous Waste Storage Area), Rickenbacker ANGB* (Parsons ES, 1995b). Groundwater sampling locations for the 1995 RNA study, and for additional groundwater monitoring activities performed in 1995 and 1996, are shown on Figure 3.2.





The following data were collected during this investigation:

- Depth from measurement datum to the water table or potentiometric surface in monitoring wells;
- Slug test water level recovery rates (used to estimate hydraulic conductivity);
- Location of potential groundwater recharge and discharge areas;
- Stratigraphy of subsurface media;
- Nature and extent of residual petroleum and chlorinated aliphatic hydrocarbon (CAH) contamination in soils;
- Total organic carbon (TOC) in select soil samples.
- Nature and extent of benzene, toluene, ethylbenzene, and xylenes (BTEX), trimethylbenzene (TMB), total petroleum hydrocarbon (TPH), and CAHs in groundwater;
- Concentrations of dissolved oxygen (DO), nitrate, ferrous iron, sulfate, methane, chloride, ammonia, and TOC in groundwater; and
- Temperature, specific conductance, reduction/oxidation (redox) potential, total alkalinity, and pH of groundwater.

An overview of these early 1995 site activities is presented in the following paragraphs. A more detailed discussion of field methods and study results is provided in the work plan (Parsons ES, 1995b). Study results are reviewed in Section 4 and detailed in the February 1997 closure plan (Parsons ES, 1997a).

Subsurface conditions at the site were characterized by the USACE and Parsons ES from February 21 through February 24, 1995, using a CPT/LIF device. Seventeen CPT pushes were performed to determine subsurface stratigraphy at the locations LIF-1 through LIF-17 (Figure 3.2). LIF was performed simultaneously at these locations to

evaluate the presence of residual or mobile (free-phase) hydrocarbons in the soil and groundwater. Final CPT logs are presented in Appendix D.

The CPT apparatus also was used to collect undisturbed soil samples at three monitoring point locations. Sample ES-SS-1 was collected from 10 to 10.7 feet bgs during the placement of monitoring point ESMP-14. Sample ES-SS-2 was collected from 14 to 14.7 feet bgs during the placement of ESMP-16. Sample ES-SS-3 was collected from 10 to 10.7 feet bgs adjacent to ESMP-12, following the placement of the monitoring point (Figure 3.1).

Thirty-four 0.5-inch inside-diameter (ID) groundwater monitoring points were installed at 17 locations in February to March 1995. Clusters of three monitoring points were installed at locations ESMP-8 and ESMP-14. Clusters of two monitoring points were installed at locations ESMP-1, ESMP-2, ESMP-3, ESMP-4, ESMP-5, ESMP-6, ESMP-7, ESMP-9, ESMP-10, ESMP-11, ESMP-13, ESMP-15, and ESMP-16. Single monitoring points were installed at locations ESMP-12 and ESMP-17. Where monitoring points were installed in clusters, the shallowest screen was placed across or just below the observed water table. Screens for deeper monitoring points within the same cluster were placed approximately 7 to 10 feet below the next shallowest point in the cluster. At the locations with paired monitoring point clusters, the point with the shallowest screened interval was designated with the suffix "S", while the point with the deeper screened interval was designated with the suffix "D". At the locations with three monitoring points, the point with the shallowest screened interval was designated with the suffix "S", the point with the intermediate screened interval was designated with the suffix "D", and the deepest point in the cluster was labeled "DD". All monitoring point locations are shown on Figure 3.2. Completion details for the monitoring points and the monitoring wells installed prior to 1997 are summarized in Table 3.2.

During the 1995 RNA investigation, groundwater samples were collected from 10 existing monitoring wells and from 31 of the 34 newly installed monitoring points.

Samples were not collected from wells MW-1 and MW-7, which were destroyed prior to the investigation during the 1995 UST removal (Ogden, 1995a), and from points ESMP-3S, ESMP-8D, and ESMP-11S, which produced an insufficient volume of groundwater. Groundwater was monitored for temperature and DO during purging.

Groundwater samples were analyzed in the field by USEPA personnel for pH, conductivity, redox potential, total alkalinity, hydrogen sulfide, ferrous iron, chloride, sulfate, nitrogen, carbon dioxide, and ammonia. Analyses for methane, ethene, fuel hydrocarbon compounds, and VOCs were performed at NRMRL in Ada, Oklahoma. Mobile, light non-aqueous-phase liquid (LNAPL) was encountered in monitoring well MW-5 near the former Building 551, and a sample of the product was collected for analysis of the mass fraction of BTEX. Analytical data collected during the RNA investigation are reviewed in Section 4 and presented in Appendix B.

In addition to the groundwater sampling, two rising head slug tests were performed on monitoring wells MW-4, MW-6, MW-9, and MW-12, all of which are screened in the UWBZ sand lenses (Figure 3.2 and Table 3.2). Hydraulic conductivities for the HWSA based on these slug tests are presented in Section 2.2.2.

3.1.3 IT Corporation 1995/1996 Groundwater Monitoring Events

Quarterly groundwater monitoring at the site commenced in August 1995 and has been performed since August 1995 by IT. Results from the August 1995 through December 1996 monitoring events are presented in the 1995 and 1996 Annual Groundwater Monitoring Reports (IT, 1997b and 1997a) and analytical data from these sampling events are provided in Appendix B. In addition, IT (1995b) collected groundwater samples from four temporary Geoprobe® points (560-01 through 560-04) during the August 1995 sampling event to evaluate the downgradient extent of CAH contamination near ESMP-17 (Figure 3.2). Data from this delineation sampling event also are presented in Appendix B. The nature and extent of VOC contamination in groundwater based on these and more recent sampling events are presented in Section 4.

3.2 PREVIOUS REMEDIATION ACTIVITIES

This section summarizes the actions that have been implemented to date at the HWSA to facilitate closure of the unit. As prescribed in the previous closure plan (Parsons ES, 1997a), to attain closure of contaminated soils and groundwater the following activities have been completed or are pending.

- Decontamination of Building 560 by cleaning the building and the drum wash pad (completed April 1996);
- Removal of the remaining four USTs (completed February 1995);
- Limited *in situ* remediation of organic soil contamination via passive or air injection bioventing (if necessary);
- Natural oxidation of residual dissolved BTEX and natural reductive dehalogenation of residual dissolved chlorinated VOCs (in progress);
- *In situ* remediation of residual dissolved chlorinated VOCs via groundwater amendment (passive or active oxygenation) (if necessary);
- Continued monitoring and site access controls as part of closure commitments (ongoing); and
- Exposure control by installation of taxiway (proposed future land use).

Additional assessment activities have been completed to optimize the final design of the closure approach based on the activities outlined above and on risk-based health standards developed for the HWSA. Decontamination of Building 560 and removal of the remaining four USTs are discussed below. The results of the additional assessment activities are presented in Section 4, and the development of site-specific health standards based on results of a risk assessment is presented in Section 5.

3.2.1 Summary of Decontamination Of Building 560

3.2.1.1 Building and Pad Decontamination Activities

Acids and spent desiccants were the most common types of waste stored in Building 560. The decontamination of Building 560 was completed as part of the IRP in April 1996. Details of the decontamination activities, including analytical results from post-decontamination sampling, are presented in a recent technical report (AFCEE, 1996a).

The decontamination plans for the building included:

- Removing all items inside the building to facilitate decontamination activities;
- Vacuuming the building to remove dust, dirt, and debris;
- Washing the floor, walls, shelving of the building and the drum wash pad with a hot-water pressure washer, scrub brushes, and an all-purpose, household detergent; and
- Triple rinsing all surfaces with hot water.

All wash and rinse water generated during decontamination activities were collected using a wet/dry vacuum and transferred to a skid-mounted storage tank for testing and disposal. After rinsing with the hot water, rinseate samples to be tested analytically to determine the effectiveness of the decontamination activities were collected. These rinseate samples were collected by pouring high-performance liquid chromatography (HPLC) water over the target media. The HPLC water was then collected for analysis. Until analytical results were received, the storage tank for the decontamination liquids was managed in compliance with all applicable hazardous waste tank requirements of the Ohio Administrative Code (OAC) 3745-66-90 through 3745-66-991.

3.2.1.2 Documenting Complete Decontamination

HPLC rinseate samples were submitted to a laboratory and analyzed using the methods listed in Table 3.3. Note that only representative analytes for each method

TABLE 3.3
HPLC RINSEATE ANALYTE LIST
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Compound	Reporting Limit (mg/L)
SW8240 - GC/MS Volatile Organics	
Acetone	0.8
Benzene	0.3
Chlorobenzene	0.1
Chloromethane	0.7
Chloroform	0.5
1,1-Dichloroethane	0.5
<i>cis</i> -1,2-Dichloroethene	0.2
<i>trans</i> -1,2-Dichloroethene	0.4
Dichloromethane	0.8
Ethylbenzene	0.3
Methyl ethyl ketone (2-butanone)	2
1,1,2,2-Tetrachloroethane	0.6
Tetrachloroethene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethene	0.2
Toluene	0.6
Vinyl Chloride	0.6
m/p-Xylenes	0.4
o-Xylene	0.3
SW8270 - GC/MS Semivolatile Organics	
Acenaphthalene	10
Anthracene	10
m, p, and o-Dichlorobenzene	10
Flourene	10
Fluoranthene	10
Hexachlorobenzene	10
2-Methylnaphthalene	10
Naphthalene	10
Phenanthrene	10
Phenol	10
Pyrene	10
1,2,4-Trichlorobenzene	10
SW8010 - Organochlorine Pesticides and PCBs	
4,4'-DDE	0.02
4,4'-DDT	0.1
Dieldrin	0.02
Endrin	0.05
Heptachlor	0.02
PCB-1221	0.5
PCB-1232	0.5
Toxaphene	1
SW7XXX - Inorganics	
Cadmium	0.5
Chromium	1
Cobalt	20
Lead	2
Nickel	20

Source: AFCEE, 1996a.

with their respective reporting limits (laboratory method detection limits [MDLs]) are provided. The building floor, walls, shelving, and drum wash pad were to be considered clean if the HPLC rinseate from the cleaning operation met the following standards:

- The federal public drinking water maximum contaminant level (MCL) as promulgated in 40 CFR 141.11 and OAC 3745-81-11 for inorganics and in 40 CFR 141.12 and OAC 3745-81-12 for organics;
- If an MCL was not available for a particular contaminant, then 15 times the federal MCL goal (MCLG), as promulgated in 40 CFR 141.50 was used as the clean standard; or
- If the product of 15 times the MCL or MCLG exceeds 1 milligram per liter (mg/L), or if neither an MCL nor an MCLG is available for a particular contaminant, 1 mg/L was used as the clean standard.
- If the MCL or MCLG was less than the contaminant's analytical detection limit using methods found in the USEPA (1986) SW846 document (*Test Methods for Evaluation Solid Waste: Physical/Chemical Methods*), 15 times the SW846 analytical detection limit was used as the clean standard.

Only a few of the analytes listed in Table 3.3 were detected in the HPLC rinseate samples at concentrations slightly above the laboratory MDL. No compounds were detected at concentrations above the "clean" standards listed above. Consequently, the decontamination of Building 560 and the concrete pad is considered complete. Analytical results and supporting documentation are provided elsewhere (AFCEE, 1996a).

3.2.1.3 Wastewater Management

All wash and rinse water generated during the Building 560/pad decontamination procedures were pumped into a temporary holding tank. A representative sample of

containerized water was collected and analyzed for VOCs, SVOCs, pesticides/polychlorinated biphenyls (PCBs), metals, and pH. Because none of the analytes were detected above the "clean" standards listed above, the containerized waste did not require management as a listed hazardous waste. On May 13, 1996, the AFBCA requested the City of Columbus to approve a 300-gallon wastewater discharge to the Columbus sewer system. After receiving approval from the City of Columbus on May 30, 1996, the AFBCA discharged the wastewater into the sanitary sewer located near Building 560 on June 4, 1996.

3.2.2 Underground Storage Tank Removal

The four former USTs (Tanks #47 through #50) located at the southwestern corner of the site (Figure 3.1) were removed by Ogden (1995a) on February 16 and 17, 1995. The following summary describes tasks performed during the tank removal process. All applicable BUSTR requirements were followed.

On February 16, 1995, the contents of the four 25,000-gallon USTs were inspected and sampled. Following sampling and prior to tank removal, the contents of the tanks were pumped out, transported offsite, and recycled. During the excavation process, a water line located near the western end of the USTs was damaged, resulting in flooding of the excavation. Two monitoring wells (MW-1 and MW-7) were also destroyed during the excavation process.

The water that had entered the UST excavation was treated onsite by Petro's mobile water treatment unit before it was discharged to the closest sanitary sewer inlet. The water pipe was disposed offsite on February 28, 1995, at the Athens-Hocking Reclamation Center. Soils surrounding the USTs were excavated and stockpiled to allow for tank removal. Excavated soils were visually examined and screened for VOC contamination using a photoionization detector (PID). Contaminated soil was segregated and placed in roll-off containers for analysis and proper disposal. Soil that was not contaminated (based on field screening) was returned to the excavation following UST removal. Concrete encountered in the excavation was placed in rolloff

containers for analysis and disposal. Following removal from the excavation, the USTs were decontaminated and transported offsite for recycling.

Two soil samples and one water sample were collected from the excavation following the removal of the USTs. One soil sample also was collected from each of the three rolloff containers in which the contaminated soil from the excavation was placed. After characterization of the soil, the contents of the rolloff containers were disposed of in an appropriate manner (Ogden, 1995a).

Following UST removal activities, the damaged water line was repaired, and the excavation was backfilled. Prior to backfilling, a layer of fine gravel was placed in the bottom of the excavation. Backfilling of the excavation was completed with the stockpiled soil from the excavation. The site was then compacted, graded, seeded, and covered with straw mulch. Complete details of the UST removal activities and analytical results for all samples collected during UST removal are presented by Ogden (1995a and 1995b).

SECTION 4

NATURE AND EXTENT OF CONTAMINATION

The purpose of this section is to describe additional assessment activities required by the February 1997 amended closure/post-closure plan (Parsons ES, 1997a) and to define the nature and extent of site contamination based on characterization data collected to date. Preliminary results of source area treatability testing also are reviewed, and chemical fate in groundwater is evaluated and discussed.

To comply with the approved closure plan (Parsons ES, 1997a), additional groundwater monitoring wells were installed in an attempt to fully delineate the CAH plume east of the HWSA. Also, pilot-scale bioventing and air sparging systems were installed to evaluate the potential effectiveness of these technologies at remediating source area contamination in soil and groundwater. As part of these activities, additional environmental sampling/monitoring was completed, and these data, combined with previously collected site characterization data, were used to perform a comprehensive risk assessment and develop risk-based health standards for the site (Section 5). Additional details regarding monitoring well and bioventing/air sparging system placement and installation, sampling methodologies, and laboratory analytical requirements and procedures, are presented in the February 1997 amended closure/post-closure plan (Parsons ES, 1997a) and the June 1997 additional assessment activities work plan (Parsons ES, 1997b).

4.1 ENVIRONMENTAL SAMPLING AND MONITORING

Environmental sampling and well installation activities were performed by IT to further clarify the nature and extent of soil and groundwater contamination at the HWSA and to provide the necessary wells and monitoring points for treatability tests

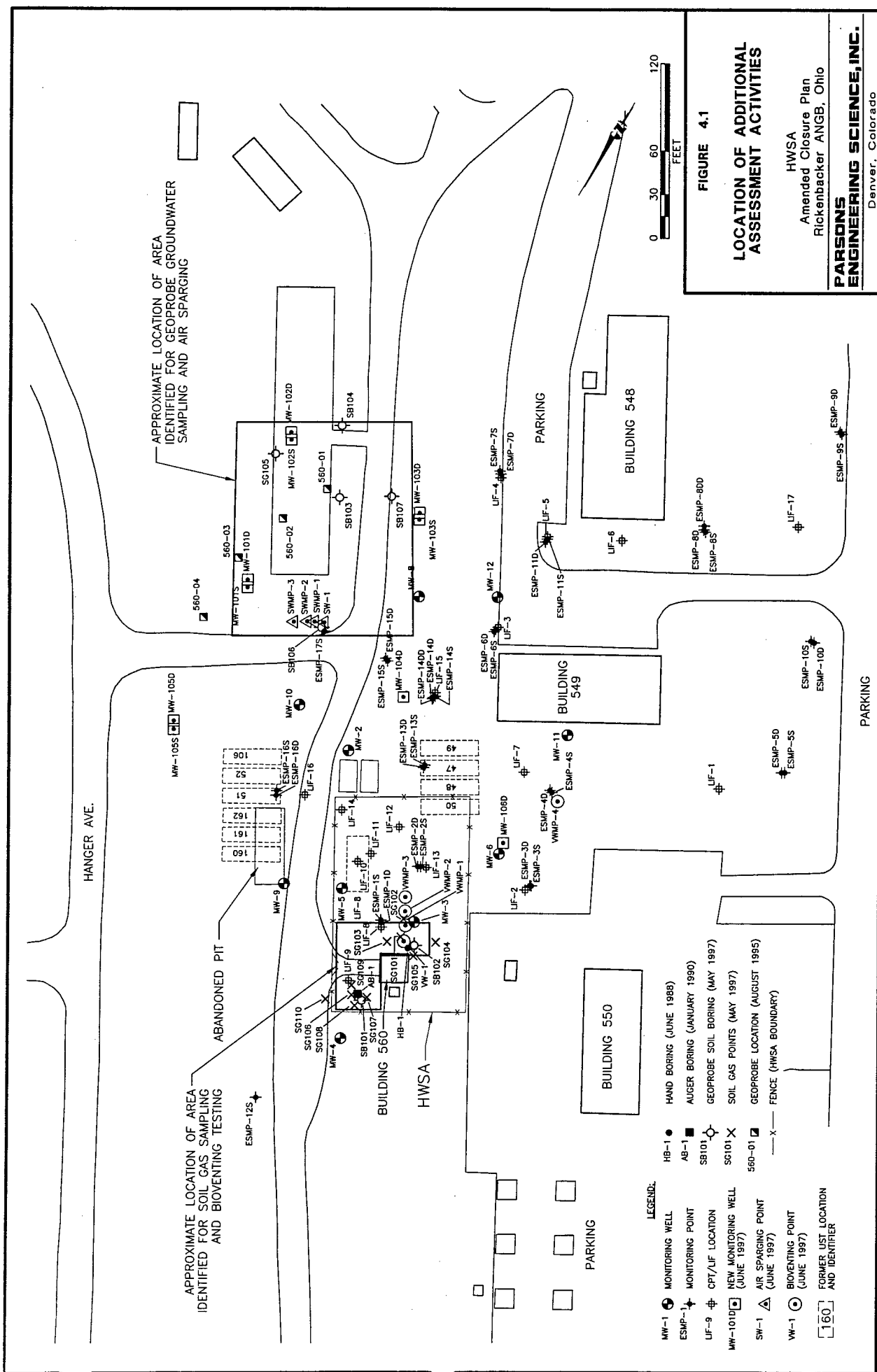
(i.e., soil bioventing and groundwater oxygenation pilot tests). The sampling and well installation was conducted in two phases. The first phase, which was performed in May 1997, involved additional delineation of the extent of soil and groundwater contamination using Geoprobe® sampling techniques. The second phase was completed in June 1997, and involved soil sampling, monitoring well installation, and installation of treatability test system wells and monitoring points using roto-sonic drilling methods.

4.1.1 Geoprobe® Investigations

Field assessment activities using Geoprobe® sampling techniques were performed by IT between 19 and 22 May 1997 at two locations. Soil and soil gas samples were collected near Building 560 to further delineate the extent of VOC soil contamination, and groundwater samples were collected approximately 150 feet east/southeast of the HWSA, near ESMP-17S, to further delineate groundwater contamination in this area. The locations of these sampling points are shown on Figure 4.1. Soil gas results from this sampling are not presented because relatively impermeable soils encountered during sampling caused excessive sample extraction vacuums and the likely dilution of vapor samples by atmospheric air leaking into the sampling train. This conclusion is confirmed by relatively high VOC concentrations in soil samples, and non-detect VOC concentrations in soil gas samples, which were collected from the same location and depth.

4.1.1.1 Source Area Soil Sampling

Soil samples were collected using the Geoprobe® at two locations which demonstrated significant petroleum hydrocarbon contamination during previous site investigations. In a June 1988 hand-boring sample (HB-1), collected approximately 10 feet southeast of Building 560 at 3 to 5 feet bgs, *o*-xylene was detected at 1,900 milligrams per kilogram (mg/kg) and ethylbenzene was detected at 120 mg/kg (Figure 4.1). Another soil sample collected in January 1990 from augered soil boring AB-1 (located approximately 20 feet northeast of Building 560) indicated lesser but still significant petroleum contamination at 8 to 10 feet bgs. At this location, total xylenes



were detected at 18 mg/kg and ethylbenzene was detected at 6.7 mg/kg. Based on these somewhat dated results, it was determined that additional sampling was warranted in this area. During the May 1997 sampling event, soil boring SB101 was installed near former soil boring AB-1, and boring SB102 was installed near former soil boring HB-1. The boring logs for SB101 and SB102 are provided in Appendix D. The soil samples were collected from 8 to 10 feet bgs in boring SB101 and from 3 to 5 feet bgs in boring SB102 using a Geoprobe® Macro-Core® sampler. The samples were shipped to Pace Analytical Services for analysis of VOCs by USEPA Method SW8260 and gasoline-range organics (GRO) by Method 8015M. The soil sample results are presented in Table 4.1.

Soil sample results from these two locations indicate that petroleum hydrocarbon contamination is still present in the vicinity of Building 560, especially near SB102. As compared to the non-detect VOC soil gas sample results from the vicinity of HB-1 and SB102 (SG101 through SG105) (Figure 4.1), the SB102 soil sample results indicate substantial hydrocarbon contamination in these vadose zone soils. A total BTEX concentration of 1,112 mg/kg was detected in this sample; the majority being xylenes. Comparatively, a total BTEX concentration of 4.2 mg/kg was detected in the 8 to 10 foot bgs sample from SB101. The sample results from SB101 are indicative of smear zone contamination near the water table in the vicinity of Building 560. The soil sample results from SB102 indicate that weathered petroleum contamination is still present in the vadose zone soils southeast of Building 560. These soil results suggest that oxygen should be utilized by fuel-degrading bacteria present in vadose zone soils and substantiated pilot-scale bioventing system installation and testing.

4.1.1.2 Groundwater Sampling Near ESMP-17S

Geoprobe® groundwater samples were collected east and southeast of ESMP-17S to delineate the downgradient extent of groundwater contamination. During the August 1995 sampling event, the only VOCs detected were 26 micrograms per liter ($\mu\text{g/L}$) of vinyl chloride (VC), 27 $\mu\text{g/L}$ of *cis*-1,2-dichloroethene (DCE), and 4 $\mu\text{g/L}$ of *trans*-1,2-DCE at Geoprobe® location 560-01 (Figure 4.1). Therefore, the May 1997 Geoprobe®

TABLE 4.1
SOIL ANALYTICAL RESULTS
MAY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Analyte	Sample Location/Depth	
	SB101 (8 to 10 ft bgs)	SB102 (3 to 5 ft bgs)
Volatile Organics ($\mu\text{g/kg}$)^{a/}		
Benzene	4,200	-- ^{b/}
Toluene	--	2,000
Ethylbenzene	690	170,000
Xylenes	1,800	940,000
Isopropylbenzene	9,200	6,900
n-Propylbenzene	1,700	1,300
1,3,5-Trimethylbenzene	2,000	1,600
1,2,4-Trimethylbenzene	1,700	4,300
sec-Butylbenzene	750	--
n-Butylbenzene	640	640
Naphthalene	2,400	2,600
1,2,3-Trichlorobenzene	460	--
Gasoline Range Organics (mg/kg)^{c/}	610	820

Note: Samples analyzed by USEPA Methods SW8260A and SW8015M.

^{a/} $\mu\text{g/kg}$ = micrograms per kilogram.

^{b/} -- = not detected.

^{c/} mg/kg = milligrams per kilogram.

sampling was focused in the vicinity of this sampling location. To facilitate groundwater sample collection, five borings were installed. Four borings (SB103, SB104, SB105, and SB107) were installed in the vicinity of 560-01, and one boring (SB106) was installed immediately adjacent to ESMP-17S. The soil boring/groundwater sampling locations are shown on Figure 4.1, and the boring logs are provided in Appendix D.

The groundwater samples were collected from 2-foot-long, stainless steel temporary well points. Groundwater samples were collected from two sand zones in four of the borings. Only one sand zone was encountered in boring SB104. The upper sand zone was encountered between depths of approximately 11 to 17 feet bgs. The second sand zone was encountered just above the gray silt and clay basal till, at depths of approximately 18 to 25 feet bgs. The temporary wells were sampled using a peristaltic pump and polyethylene tubing. The samples were analyzed for VOCs by USEPA Method SW8260 at the mobile laboratory.

Results from the May 1997 Geoprobe® groundwater sampling are summarized on Table 4.2. As expected, the VC and *cis*-1,2-DCE concentrations detected in the sample from the 14- to 16-foot-bgs sample at SB106 were similar to those recently measured at ESMP-17S, screened from approximately 13 to 16 feet bgs (IT, 1997a and 1997b). VOC contamination was not evident in the lower sand zone at any of the sampling locations. VOCs were detected in the upper sand zone sample collected at SB103, at generally lower concentrations than were detected in the May 1995 sample from this location (560-01). No other VOC contamination was evident in this area. These data were used to help determine the placement of the new downgradient monitoring wells required by the February 1997 amended closure/post-closure plan (Parsons ES, 1997a).

4.1.2 Well and Monitoring Point Installation and Sampling

In June 1997, the additional monitoring wells, the vent well (VW) and vapor monitoring points (MPs) for the bioventing system, and the sparge well (SW) and MPs

TABLE 4.2
GROUNDWATER ANALYTICAL RESULTS
MAY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

	Sample ID/Depth ^{a/}									
	SB103GO01	SB103GO02	SB104GO01	SB105GO01	SB105GO02	SB106GO01	SB106GO02	SB107GO01	SB107GO02	
	11.5 - 13.5	18 - 20	15 - 17	14 - 16	20 - 22	14 - 16	20 - 22	12 - 14	22 - 24	
Volatile Organic Compounds (µg/L) ^{b/}										
Chloromethane	1.3	-- ^d	--	--	--	6.1	--	--	--	
Vinyl Chloride	--	--	--	--	--	680E ^{d/}	--	--	--	
1,1-Dichloroethene	--	--	--	--	--	5.8	--	--	--	
Methylene Chloride	--	--	--	--	--	3.3	--	--	--	
trans-1,2-Dichloroethene	--	--	--	--	--	80	--	--	--	
cis-1,2-Dichloroethene	5.3	--	--	--	--	1,900E	--	--	--	
Trichloroethene	1.3	--	--	--	--	--	--	--	--	
Naphthalene	4.0	--	--	--	--	--	--	--	--	

Note: Samples analyzed by USEPA Method SW8260 at the mobile laboratory.

a/ Sample depth given in feet below ground surface.

b/ µg/L = Micrograms per liter.

c/ -- = Not detected.

d/ E = Concentration exceeded upper calibration standard; value shown represents an estimated concentration.

for the air sparging system were installed by IT. Soil samples were collected from the bioventing and air sparging system boreholes during drilling activities. Rotasonic drilling techniques were used to obtain a continuous core sample from each borehole and to minimize the generation of soil cuttings requiring disposal.

4.1.2.1 Installation of Additional Monitoring Wells

Four additional groundwater monitoring well clusters (MW-101S and D, MW-102S and D, MW-103S and D, and MW-105S and D) were installed downgradient from the HWSA. Two additional crossgradient monitoring wells MW-104D and MW-106D were installed south and southeast of the HWSA as part of the post-closure monitoring network (Figure 4.1). The well locations were determined based on the results of the May 1997 Geoprobe® groundwater sampling and mobile laboratory analysis.

The wells were constructed of 2-inch-diameter polyvinyl chloride (PVC) casing and screen. The lengths and depths of the screened sections was determined by the depths and thicknesses of the sand seams encountered. Wells were not screened across more than one sand zone. Well completion details for the newly installed groundwater monitoring wells are presented in Table 4.3. Following installation of the new wells in June 1997, IT measured groundwater elevations at all site monitoring wells and performed groundwater sampling. Table 4.4 presents the groundwater elevation data for this monitoring event, and Figure 4.2 illustrates the June 1997 potentiometric surface for the site. Groundwater sampling results from June/July 1997 are presented in Section 4.2.2.

The potentiometric surface shown on Figure 4.2 is based on groundwater elevations at ESMP-1D, -4D, -13S, and -17S, and MW-2. The hydraulic gradient between the HWSA and ESMP-17S appears to be consistent with previous site measurements presented in Section 2.2.2 (approximately 0.005 ft/ft). Considering the well installation depths listed in Table 4.3, monitoring wells MW-101S, MW-102S, MW-103S, and MW-105S appear to have been installed in the same sand zone as ESMP-17S. However, the high groundwater elevations at MW-102S and MW-103S

TABLE 4.3
JUNE 1997 MONITORING WELL COMPLETION DETAILS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Easting	Northing	Datum Elevation (ft msl) ^{a/}	Ground Elevation (ft msl)	Depth to Top of Screen ^{b/} (feet bgs)	Depth to Bottom of Screen (feet bgs)	Screen Length (feet)	Screen Diameter (inches)	Riser Diameter (inches)
MW-101S	1845251	662509	739.34	739.47	8.5	13.5	5	2	2
MW-101D	1845254	662506	739.41	739.52	16.5	21.5	5	2	2
MW-102S	1845299	662415	739.50	739.61	8.5	13.5	5	2	2
MW-102D	1845302	662413	739.52	739.74	16.75	21.75	5	2	2
MW-103S	1845197	662394	740.15	740.32	10	15	5	2	2
MW-103D	1845199	662391	740.30	740.36	18	23	5	2	2
MW-104D	1845118	662492	740.88	741.04	19	24	5	2	2
MW-105S	1845218	662617	739.10	739.16	9	14	5	2	2
MW-105D	1845222	662613	738.99	739.18	18	23	5	2	2
MW-106D	1844997	662516	741.37	741.52	17.5	22.5	5	2	2

^{a/} ft msl = feet above mean sea level.

^{b/} bgs = below ground surface.

TABLE 4.4
GROUNDWATER ELEVATION DATA
JUNE 17, 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Datum Elevation (ft msl) ^{a/}	Depth to Water (ft) ^{b/}	Elevation (ft msl)
MW-02	743.36	10.70	732.66
MW-03	743.96	10.02	733.94
MW-04	745.15	10.57	734.58
MW-05	744.97	12.15	732.82
MW-06	745.18	12.37	732.81
MW-08	743.89	7.82	736.07
MW-09	745.25	7.93	737.32
MW-10	742.64	9.75	732.89
MW-11	744.15	10.92	733.23
MW-12	743.02	9.42	733.60
MW-101S	739.34	8.92	730.42
MW-101D	739.41	6.39	733.02
MW-102S	739.50	6.04	733.46
MW-102D	739.52	1.72	737.80
MW-103S	740.15	5.98	734.17
MW-103D	740.30	7.80	732.50
MW-104D	740.88	8.51	732.37
MW-105S	739.10	7.83	731.27
MW-105D	738.99	3.18	735.81
MW-106D	741.37	8.87	732.50
ESMP-1S	741.67	6.99	734.68
ESMP-1D	741.72	8.68	733.04
ESMP-2S	741.18	3.35	737.83
ESMP-2D	741.29	8.29	733.00
ESMP-3S	742.23	8.25	733.98
ESMP-3D	742.22	9.23	732.99
ESMP-4S	742.70	9.34	733.36
ESMP-4D	742.69	9.55	733.14
ESMP-5S	741.51	4.17	737.34
ESMP-5D	741.56	6.99	734.57
ESMP-6S	740.98	8.30	732.68
ESMP-6D	741.05	8.15	732.90
ESMP-7S	740.85	4.76	736.09
ESMP-7D	740.80	8.76	732.04

TABLE 4.4 (Continued)
GROUNDWATER ELEVATION DATA
JUNE 17, 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Datum Elevation (ft msl) ^{a/}	Depth to Water (ft) ^{b/}	Elevation (ft msl)
ESMP-8S	740.92	2.81	738.11
ESMP-8D	740.89	6.86	734.03
ESMP-8DD	740.83	7.74	733.09
ESMP-9S	741.79	3.65	738.14
ESMP-9D	741.70	7.37	734.33
ESMP-10S	741.56	7.20	734.36
ESMP-10D	741.54	7.98	733.56
ESMP-11S	740.76	6.88	733.88
ESMP-11D	740.80	8.70	732.10
ESMP-12S	742.43	1.68	740.75
ESMP-13S	741.38	8.60	732.78
ESMP-13D	741.38	8.58	732.80
ESMP-14S	741.17	8.37	732.80
ESMP-14D	741.18	8.34	732.84
ESMP-14DD	741.13	8.22	732.91
ESMP-15S	740.37	7.77	732.60
ESMP-15D	740.28	7.44	732.84
ESMP-16S	740.33	7.47	732.86
ESMP-16D	740.33	7.31	733.02
ESMP-17S	739.87	7.99	731.88

^{a/} ft msl = feet above mean sea level.

^{b/} Feet below top of casing.

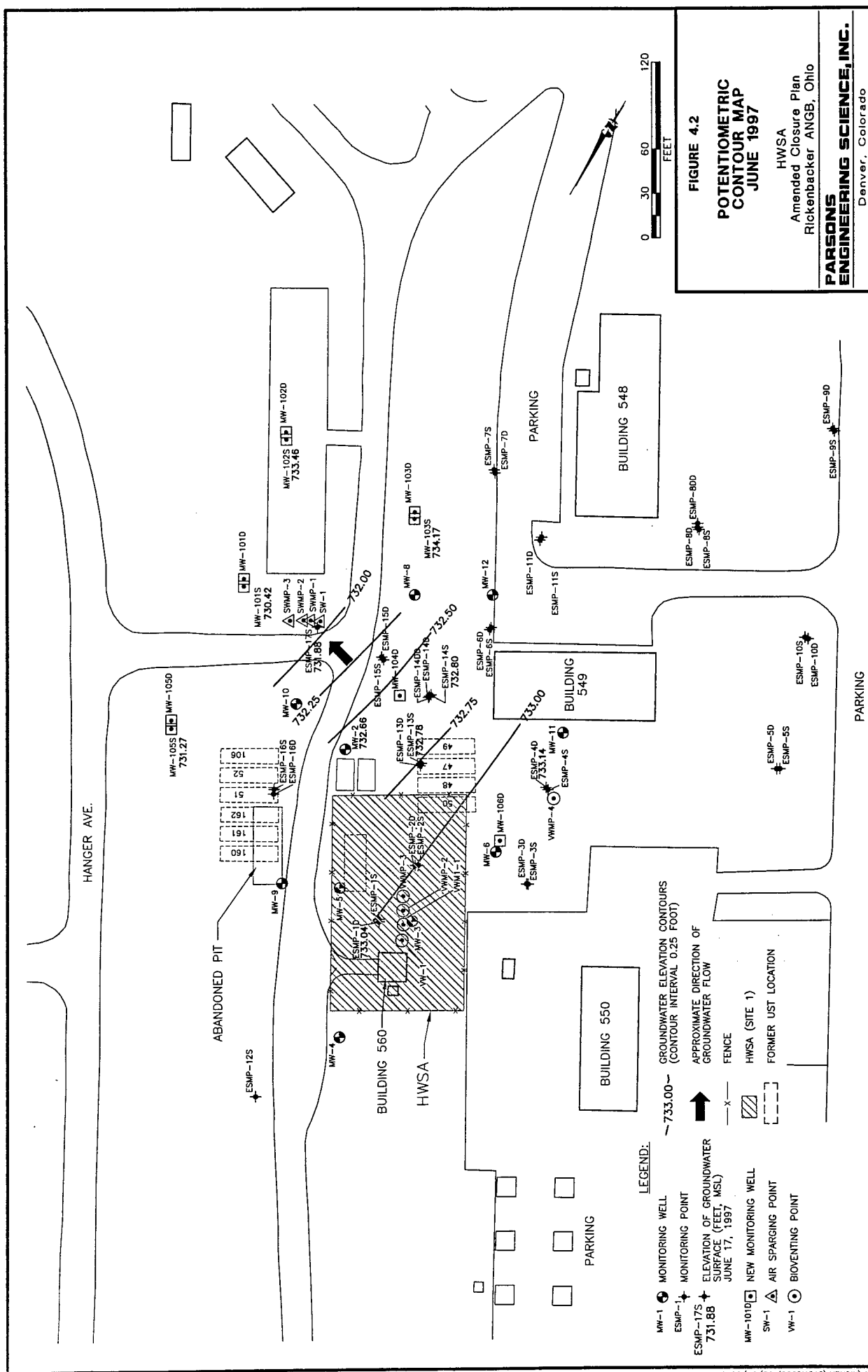


FIGURE 4.2
POTENTIOMETRIC
CONTOUR MAP
JUNE 1997

HWSA
 Amended Closure Plan
 Rickenbacker ANGB, Ohio

PARSONS
ENGINEERING SCIENCE, INC.
 Denver, Colorado

and the relatively low groundwater elevations at MW-101S and MW-105S (Table 4.4 and Figure 4.2) suggest that the groundwater levels in these newly installed wells may not have sufficiently stabilized prior to initial measurement of the groundwater elevations and may not be representative of the actual potentiometric surface elevation in this sand zone. Subsequent quarterly monitoring events will be necessary to establish the potentiometric surface in the vicinity of these new monitoring wells and verify the hydraulic gradient.

4.1.2.2 Installation of Bioventing Wells and Monitoring Points

Based on the elevated hydrocarbon concentrations detected in soil sample SB102 in May 1997 (Section 4.1.1.2), a bioventing VW (VW-1) and three multi-depth MPs (VWMP-1, VWMP-2, and VWMP-3) were installed on the southeast site of Building 560 for treatability testing. A fourth background MP (VWMP-4) was installed near ESMP-4S and -4D, south of Building 560. The VW and MP locations and completion details are presented in Figure 4.1 and Table 4.5, respectively. A cross section of the bioventing system configuration is shown on Figure 4.3.

The VW screen was placed from approximately 3.4 to 8.4 feet bgs for air injection treatment of vadose zone soils. The casing and screen were constructed with 2-inch-diameter Schedule 40 PVC. A 0.04-inch slotted screen was installed. The MPs were constructed with 6-inch-long sections of 1-inch-diameter Schedule 40 PVC, 0.020-inch slotted well screen, and 0.25-inch Schedule 80 PVC risers. Additional details on the bioventing system are presented in the June 1997 work plan (Parsons ES, 1997b) and the treatability testing results report (IT, 1997c).

During rotosonic drilling of the bioventing system boreholes, soil samples were collected by IT and sent to Pace Analytical Services for laboratory analysis. Soil samples were analyzed for VOCs, SVOCs, and TPH (gasoline- and diesel-range organics) by USEPA Methods SW8260, SW8270B, SW8015M, respectively. In addition, soil samples were analyzed for target-analyte-list (TAL) metals, ammonia, ortho-phosphate, pH, and percent moisture. Soil analytical data are presented in

TABLE 4.5
BIOVENTING SYSTEM COMPLETION DETAILS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Easting	Northing	Ground Elevation (ft msl) ^{a/}	Depth to Top of Screen (feet bgs) ^{b/}	Depth to Bottom of Screen (feet bgs)	Screen Length (feet)	Screen Diameter (inches)	Riser Diameter (inches)
VW-1	1844998	662613	741.65	3.4	8.4	5	2	2
VWMP-1S	1845005	662606	741.53	3.75	4.5	0.75	1	0.25
VWMP-1D	1845005	662606	741.53	7.75	8.5	0.75	1	0.25
VWMP-2S	1845012	662599	740.95	3.25	4	0.75	1	0.25
VWMP-2D	1845012	662599	740.95	7.25	8	0.75	1	0.25
VWMP-3S	1845018	662592	740.91	3.25	4	0.75	1	0.25
VWMP-3D	1845018	662592	740.91	7.25	8	0.75	1	0.25
VWMP-4S	1844994	662444	742.43	3.25	4	0.75	1	0.25
VWMP-4D	1844994	662444	742.43	7.25	8	0.75	1	0.25

^{a/} ft msl = feet above mean sea level.

^{b/} bgs = below ground surface.

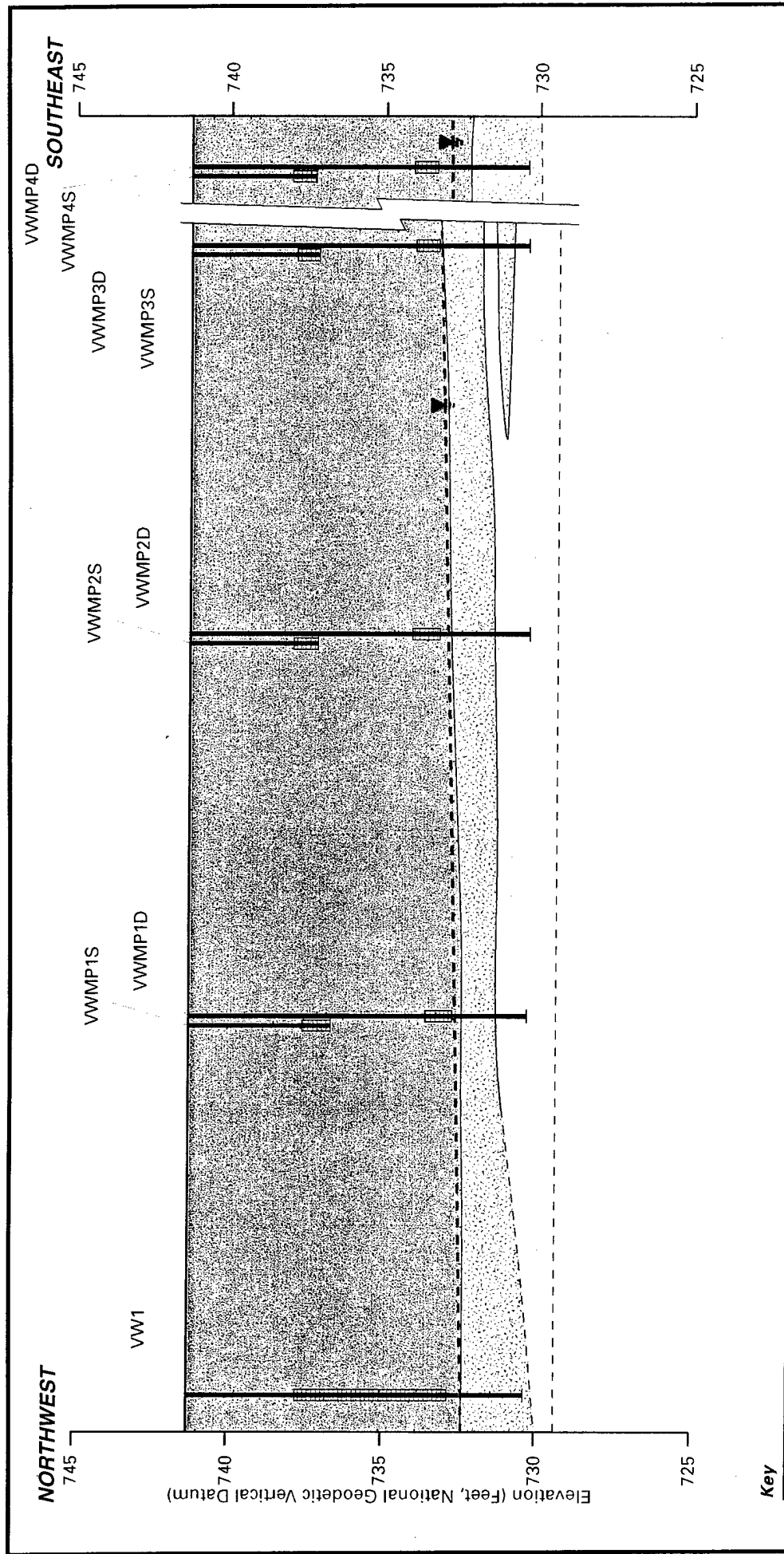


FIGURE 4.3

BIOVENTING SYSTEM CROSS SECTION

HWSA
Amended Closure Plan
Rickenbacker ANGB, Ohio

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Denver, Colorado

Appendix C. The inorganic and organic soil sample results are summarized in Tables 4.6 and 4.7, respectively. Soil results from this sampling event and previous sampling events at the HWSA are discussed in Section 4.2.

4.1.2.3 Installation of Air Sparging Wells

Based on historical elevated concentrations of VOCs in groundwater near ESMP-17S, one air sparging well (SW-1) and three monitoring wells (SWMP-1, SWMP-2, and SWMP-3) were installed in this area (Figure 4.1). Each of the wells was drilled using rotosonic drilling techniques. At each well location, a vadose zone screened interval (VZMP-1, VZMP-2, VZMP-3, and VZMP-4), similar to the bioventing system MPs, was installed to evaluate diffusion of oxygen from the saturated sand zone treatment area into the overlying clay. The vadose zone MPs were installed approximately 3 to 4 feet bgs. One or two screened intervals were installed within the saturated sand zone between 10 and 16 feet bgs. These intervals were completed with 6-inch to 2-foot lengths of 2-inch-diameter, 0.02-inch slotted PVC screen.

The air sparging system completion details are presented in Table 4.8, and a cross section of the system configuration is shown in Figure 4.4. Additional details on the air sparging system are presented in the June 1997 work plan (Parsons ES, 1997b) and the treatability testing results report (IT, 1997c). Soil samples also were collected during installation of the air sparging wells, and the analytical results are provided in Appendix C.

4.2 NATURE AND EXTENT OF CONTAMINATION

This section briefly summarizes the nature and extent of VOCs, SVOCs, and metals in site soils and groundwater. Soil contaminant data are summarized from site investigations conducted between June 1988 and June 1997. Groundwater contaminant data are primarily based on results obtained during the June/July 1997 comprehensive groundwater sampling performed by IT; however, results from previous sampling events also are provided for comparison. Emphasis is given to describing the extent of dissolved VOC contamination in groundwater, as VOCs generally are more mobile than

TABLE 4.6
METALS IN SOIL
JUNE 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

ANALYTE (mg/kg) ^a	SAMPLE ID/SAMPLE DEPTH											
	VWIS001 8-9 ^b	VWMP1S001 3.5-4.5	VWMP1S002 7.5-8.5	VWMP1S052 ^d 7.5-8.5	VWMP2S001 3-4	VWMP2S002 7-8	VWMP3S001 3-4	VWMP3S002 7-8	VWMP4S001 3-4	VWMP4S051 ^d 3-4	VWMP4S002 7-8	
Aluminum	5,800	10,000	7,400	5,900	10,000	7,000	8,000	5,900	14,000	18,000	6,300	
Antimony	-- ^d	--	--	--	--	--	--	--	--	--	--	
Arsenic	9.9	9.5	10	8.2	9.1	9.9	8.4	10	11	9.5	8.8	
Barium	57	94	59	68	82	49	66	57	130	190	64	
Beryllium	0.49	0.71	0.52	0.46	0.65	0.52	0.50	0.44	0.99	1.2	0.45	
Cadmium	--	--	--	--	1.1	--	0.88	--	--	--	--	
Calcium	63,000	32,000	73,000	78,000	18,000	53,000	31,000	71,000	5,200	6,300	86,000	
Chromium	8.8	14	11	9.4	13	10	11	9.1	19	22	10	
Cobalt	11	13	12	12	11	11	12	13	17	16	12	
Copper	24	27	26	25	24	26	21	26	35	30	23	
Iron	25,000	27,000	23,000	21,000	26,000	24,000	22,000	24,000	35,000	37,000	22,000	
Lead	6.4	8.1	6.8	6.1	8.0	6.4	8.7	7.0	7.8	7.9	6.2	
Magnesium	21,000	11,000	22,000	24,000	7,400	23,000	9,400	24,000	3,800	4,500	24,000	
Manganese	280	400	290	390	320	230	390	310	560	640	340	
Mercury	0.033	0.027	--	0.025	0.032	0.026	0.027	0.030	0.043	0.033	0.026	
Nickel	31	31	31	28	26	32	21	36	48	41	30	
Potassium	1,200	1,200	1,900	1,400	950	1,500	1,000	1,300	1,700	1,400	1,600	
Selenium	0.97	0.64	0.82	--	1.9	0.63	0.88	--	1.1	0.87	1.2	
Thallium	2.5	2.6	1.7	1.7	2.6	2.1	2.3	2.8	2.9	3.3	2.4	
Silver	--	--	--	--	--	--	--	--	--	--	--	
Sodium	95	95	130	120	83	110	93	120	71	69	120	
Vanadium	19	26	23	19	25	22	22	18	37	38	19	
Zinc	110	89	92	86	76	99	65	110	110	110	81	

^a mg/kg = milligram per kilogram.

^b Sample depth in feet below ground surface.

^c Represents a sample duplicate for the sample depth interval shown.

^d -- = not detected.

TABLE 4.7
ORGANICS DETECTED IN SOIL
JUNE 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

ANALYTE	VW/IS001 8-gal/	VWMP1S001 3.5-4.5	VWMP1S002 7.5-8.5	VWMP1S052b/ 7.5-8.5	SAMPLE ID/SAMPLE DEPTH				VWMP4S001 3-4	VWMP4S002 7-8	VWMP4S051b/ 3-4
					VWMP2S001 3-4	VWMP2S002 7-8	VWMP2S001 3-4	VWMP2S002 7-8			
Semivolatiles (mg/kg) c/											
USEPA Method SW8270B											
Anthracene	-- d/	--	--	--	--	--	0.042 J ^{e/}	--	--	--	--
Benzo (a) anthracene	--	--	--	--	--	--	0.092 J	--	--	--	--
Benzo (b) fluoranthene	--	--	--	--	--	--	0.11 J	--	--	--	--
Benzo (k) fluoranthene	--	--	--	--	--	--	0.058 J	--	--	--	--
Benzo (a) pyrene	--	--	--	--	--	--	0.092 J	--	--	--	--
Benzo (g,h,i) pyrene	--	--	--	--	--	--	0.047 J	--	--	--	--
Bis (2-ethylhexyl) phthalate	--	--	1.1	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	0.11 J	--	--	--	--
Fluoranthene	--	--	--	--	--	--	0.33 J	--	--	--	--
Indeno (1,2,3-cd) perylene	--	--	--	--	--	--	0.060 J	--	--	--	--
2-Methylnaphthalene	3.5 E ^{f/}	--	--	--	--	--	--	--	--	--	--
Naphthalene	1.6	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	0.24 J	--	--	--	--
Pyrene	--	--	--	--	--	--	0.22 J	--	--	--	--
Volatiles (mg/kg)											
USEPA Method SW8260A											
Acetone	0.043 Bg/ 0.011 B	7.1 B 63 EB	7.6 B --	0.042D ^{b/} B --	0.021 DJB --	0.036 DB 0.0039 J	6.0 B 0.26 JB	0.039 D ^{f/} B 0.0020 J	0.0086 B 0.011	--	0.0081 B 0.0044 J
2-Butanone	--	--	--	0.032 D	--	0.0026 JB	--	--	--	--	0.0027 JB
Ethylbenzene	0.86 E	0.54 J	--	0.0025 J	0.0018 J	--	2.4	--	0.0024 J 0.0090	--	0.0018 J 0.0020 J
4-Methyl-2-pentanone	--	--	--	--	--	--	--	--	--	0.0022 J	--
Methylene Chloride	--	2.7 B	2.5 B	--	--	--	0.78 B	--	--	--	--
Styrene	0.036	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	0.0026 J	--	--	--	--	--	--	--	--	--	--
Toluene	0.13	--	--	0.011 DJ	--	0.015 DJ	--	--	--	--	--
Trichloroethene	0.0024 J	--	--	--	--	--	--	--	--	--	--
Xylenes	3.4 EB	1.1	--	0.0082 B	0.0032 JB	0.0048 JB	12	0.0040 JB	0.0087 B	0.0061 B	0.0068 B
USEPA Method SW 8015											
Gasoline Range Organics (mg/kg)	300 E	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics (mg/kg)	270	--	--	--	--	--	--	--	--	--	--

a/ Sample depth in feet below ground surface.

b/ Represents a sample duplicate for the sample depth interval shown.

c/ mg/kg = milligram per kilogram.

d/ -- = not detected.

e/ J = indicates an estimated value. The compound was detected, but was below the laboratory reporting limit.

f/ E = concentration exceeded the upper calibration standard; value shown represents an estimated concentration.

g/ B = analyte found in associated blank as well as in sample.

h/ D = compound analyzed at a secondary dilution factor.

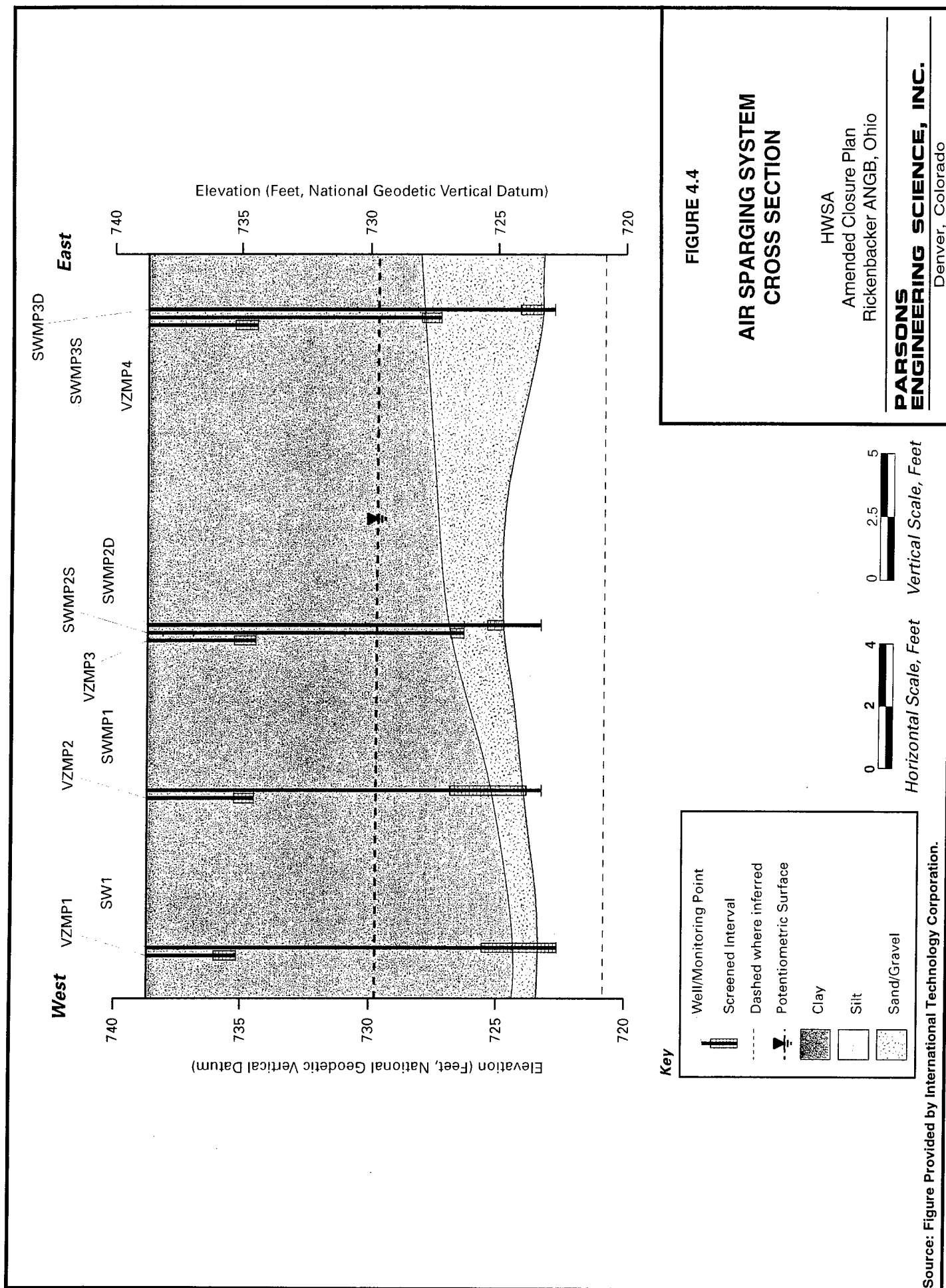
TABLE 4.8
AIR SPARGING SYSTEM COMPLETION DETAILS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Well ID	Easting	Northing	Datum Elevation (ft msl) ^{a/}	Ground Elevation (ft msl)	Depth to Top of Screen ^{b/} (feet bgs)	Depth to Bottom of Screen (feet bgs)	Screen Length (feet)	Screen Diameter (inches)	Riser Diameter (inches)
SW-1	1845196	662492	739.59	739.81	13.2	15.2	2	2	2
SWVZ-1	1845196	662492	NA ^{c/}	739.81	2.75	3.5	0.75	1	0.25
SWMP-1	1845200	662495	739.31	739.72	12.12	14.12	2	2	2
SWVZ-2	1845200	662495	NA	739.72	3.5	4.25	0.75	1	0.25
SWMP-2S	1845203	662498	739.53	739.80	12.08	12.58	0.5	2	2
SWMP-2D	1845203	662498	739.38	739.80	13.5	14	0.5	2	2
SWVZ-3	1845203	662498	NA	739.80	3.5	4.25	0.75	1	0.25
SWMP-3S	1845210	662505	739.59	739.74	10.83	11.33	0.5	2	2
SWMP-3D	1845210	662505	739.41	739.74	14.75	15.25	0.5	2	2
SWVZ-4	1845210	662505	NA	739.74	3.5	4.25	0.75	1	0.25

^{a/} ft msl = feet above mean sea level.

^{b/} bgs = below ground surface.

^{c/} NA = not applicable.



the other contaminants (i.e., metals and SVOCs), and better represent the areal extent of groundwater contamination in the vicinity of the HWSA.

4.2.1 Soil Quality

Other than the May and June 1997 soil sampling performed during the bioventing system installation (Figure 4.1), the majority of soil sampling at the HWSA primarily was performed during early site investigations (June 1988 through October 1991). Soil samples collected during these investigations typically were analyzed for VOCs, SVOCs, and metals, although not all soil samples were analyzed for all parameters. The surface soil samples collected from the sampling grid (designated "SU" and "SS") were analyzed for SVOCs and metals. The auger boring samples, hand boring samples, and the soil samples from monitoring well borings (designated "AB", "HB", and "MW") were analyzed for VOCs, SVOCs, and metals. Soil sampling locations and analytical results for sampling conducted prior to 1997 are presented on Figure 3.1 and in Appendix B, respectively. The 1997 sampling locations and analytical results are presented on Figure 4.1 and in Appendix C, respectively. Soil analytical results are summarized in the following sections for three depth intervals: 0 to 2 feet, 3 to 5 feet, and 7 to 10 feet bgs. Significant soil sampling results from UST removal and closure activities also are presented. Maximum soil contaminant concentrations for soils between 0 and 10 feet bgs, based on the 1997 and all previous sampling events, are provided in Appendix E. Soil results from depths greater than 10 feet bgs are included in the analytical data provided in Appendix B.

4.2.1.1 Depth Interval 0 to 2 Feet

Near-surface soil samples that have been analyzed for VOCs at the HWSA include samples from borings HB-1 through HB-6 (collected in June 1988) and from MW-2 (collected in August 1988). The highest VOC detections were *o*-xylene in HB-1 at 440 mg/kg, *o*-xylene in HB-2 at 43 micrograms per kilogram ($\mu\text{g/kg}$), and methylene chloride in the sample from MW-2 at 5 $\mu\text{g/kg}$.

Sixty-one near-surface soil samples (0 to 2 feet bgs) have been collected at, or in the vicinity of, the HWSA and analyzed for metals since June 1988. Based on these sample results, cadmium is the metal most often detected at, or above, the 95-percent upper confidence limit (UCL) of the mean background concentration of 0.77 mg/kg (IT, 1997d) (Appendix E). Results from 22 surface soil samples collected in and around the HWSA indicate cadmium concentrations greater than 0.77 mg/kg, and the maximum cadmium concentration (9.1 mg/kg) was detected in a composite soil sample from SU-9 and SU-10 (Figure 3.1). Cadmium concentrations appear to be greatest in soil samples collected in the southwestern two-thirds of the site (SU-5 through SU-16 and HB-1 and HB-2). Chromium was detected in 10 samples at concentrations greater than its background level (18.8 mg/kg), with a maximum concentration of 25.6 mg/kg (SU-5 and SU-6 composite sample). Other metals detected above background levels in the 0- to 2-foot interval include arsenic (42 mg/kg at HB-4), beryllium (1.8 mg/kg at SU-20), and silver (7.2 mg/kg at SU-26, 3 mg/kg at SS-1, and 1.8 mg/kg at SU-46).

Several SVOCs were detected in surface soil samples collected within and near the HWSA. Based on the initial comparison criteria presented in the June 1997 work plan (Parsons ES, 1997b), benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were the four SVOCs most frequently detected at potentially significant concentrations. The highest concentrations of SVOC contamination within the HWSA boundary appear to be on the southern side of Building 560 and its driveway near SU-5 and SU-6 (Figure 3.1). In a composite sample collected from these two locations in June 1988, benzo(a)anthracene was detected at 2.1 mg/kg, benzo(a)pyrene was detected at 2.6 mg/kg, benzo(b)fluoranthene was detected at 3.2 mg/kg, and indeno(1,2,3-cd)pyrene was detected at 1.7 mg/kg. It should be noted, however, that SVOC contamination has been detected outside the fence (outside the HWSA) near the western corner of the site at levels far exceeding concentrations detected within the HWSA. In a January 1990 sample collected from SU-45 (approximately 15 feet outside the HWSA), benzo(a)anthracene was detected at 15 mg/kg, benzo(a)pyrene was detected at 15 mg/kg, benzo(b)fluoranthene was detected at 14 mg/kg, and

indeno(1,2,3-cd)pyrene was detected at 10 mg/kg. Benzo(k)fluoranthene, chrysene, and dibenz(a,h)anthracene also have been detected at elevated concentrations both within and outside the HWSA, and naphthalene was detected at 5.4 mg/kg from the soil sample collected at HB-2 (Figure 3.1).

4.2.1.2 Depth Interval 3 to 5 feet

Twenty-four soil samples have been collected from the 3- to 5-foot depth interval within and around the HWSA. VOCs have been detected in 10 of these 24 samples. The VOCs detected at the highest concentrations in samples collected prior to 1997 were from HB-1, where ethylbenzene was detected at 120 mg/kg and *o*-xylene was detected at 1,900 mg/kg. The VOCs detected in the May 1997 and June 1997 sampling events are listed in Tables 4.1 and 4.7, respectively. The highest VOC detections during the June 1997 sampling event were from VWMP-3, where xylenes were detected at 12 mg/kg and ethylbenzene was detected at 2.4 mg/kg. At VWMP-1, xylenes were detected at 1.1 mg/kg, and 2-butanone was detected at 63 mg/kg; however, 2-butanone also was detected in the associated sample blank.

Twenty-three soil samples collected from the 3- to 5-foot depth interval have been analyzed for metals. From samples collected within the HWSA prior to 1997, arsenic was detected at 29 mg/kg at HB-4, cadmium was detected at 3.3 mg/kg at AB-6, and thallium was detected at 1.1 mg/kg and 1.2 mg/kg at AB-1 and AB-2, respectively. Elevated metals detections also have occurred in samples collected outside of the HWSA. Arsenic was detected at 20.7 mg/kg in the MW-12 borehole located approximately 140 feet south of the HWSA. Beryllium and chromium were detected at 1 mg/kg and 28.6 mg/kg, respectively, at MW-10, which is located approximately 70 feet southeast of the HWSA (Figure 3.1). For soil samples collected in June 1997, metal detections were most significant at VWMP-4 in the 3- to 4-foot depth interval (Table 4.6). At VWMP-4, barium was detected at 190 mg/kg, beryllium was detected at 1.2 mg/kg, manganese was detected at 640 mg/kg, and vanadium was detected at 38 mg/kg.

Since June 1988, 23 soil samples collected within and around the HWSA from the 3- to 5-foot depth interval have been analyzed for SVOCs. SVOCs were not detected in 18 of these soil samples. At HB-1, HB-2, and AB-2, naphthalene concentrations of 1,600 $\mu\text{g/kg}$, 570 $\mu\text{g/kg}$, and 1,200 $\mu\text{g/kg}$, respectively, were detected. Also, benzo(b)fluoranthene was detected at 170 $\mu\text{g/kg}$ in the soil sample collected at AB-4.

4.2.1.3 Depth Interval 7 to 10 Feet

VOCs have been detected in 13 of the 25 soil samples collected from the 7- to 10-foot depth interval since June 1988. Pre-1997 sample results from within the HWSA are as follow: AB-1 contained ethylbenzene at 6.7 mg/kg, *m/p*-xylene at 6.0 mg/kg, and *o*-xylene at 12 mg/kg; AB-3 contained benzene at 39 $\mu\text{g/kg}$; AB-4 contained acetone at 250 $\mu\text{g/kg}$, *o*-xylene at 51 $\mu\text{g/kg}$, *m/p*-xylene at 36 $\mu\text{g/kg}$, and ethylbenzene at 20 $\mu\text{g/kg}$; AB-6 contained benzene at 1 $\mu\text{g/kg}$; AB-14 contained benzene at 15 mg/kg, ethylbenzene at 15 mg/kg, *m/p*-xylene at 15 mg/kg, and *o*-xylene at 27 mg/kg. From the MW-7 borehole, formerly located adjacent to the four USTs at the southern corner of the site (Figure 3.1), benzene was detected at 2.1 mg/kg, ethylbenzene was detected at 980 $\mu\text{g/kg}$, *m/p*-xylene at 1.2 mg/kg, *o*-xylene was detected at 1.2 mg/kg, and 1,1,1-trichloroethane (1,1,1-TCA) was detected at 86 $\mu\text{g/kg}$. In the June 1997 soil samples, xylenes were detected at 3.4 mg/kg, GRO were detected at 300 mg/kg, and diesel-range organics (DRO) were detected at 270 mg/kg at the VW-1 borehole (Figure 4.1).

Twenty-three soil samples collected at the 8- to 10-foot depth interval in the HWSA vicinity have been analyzed for metals and SVOCs. Elevated metal detections from within the HWSA include arsenic (26 mg/kg) from the MW-5 borehole sample and thallium (10.5 mg/kg) from the MW-3 borehole sample. SVOCs were not detected in 17 of the 23 samples. Naphthalene was detected at 1.8 mg/kg at AB-2 and 1.6 mg/kg at VW-1. 2-Methylnaphthalene and bis(2-ethylhexyl)phthalate also were detected in the June 1997 samples from VW-1 and VWMP-1, respectively (Table 4.7).

4.2.1.4 UST Closure Soil Sampling

Soil samples were collected as part of the UST closure activities conducted in 1994 through 1996 for the 15 former USTs (Tanks #47 through #57, #106, #160, #161, and #162) located near the HWSA (Ogden, 1995a and 1995b). Results for *cis*-1,2-DCE (5.8 mg/kg), *trans*-1,2-DCE (570 µg/kg), 1,1,2,2-tetrachloroethene (6.3 µg/kg), trichloroethene (TCE) (2.6 mg/kg), and VC (1.3 µg/kg) all represent the maximum detected site soil concentrations for these compounds. The two soil samples represented by these values (samples HWSA-TP48-2W and HWSA-TP48-2WD) were collected from the western end of the excavation for former Tank #48, at the bottom of the pit (Figure 3.1).

4.2.1.5 Soil Contamination Summary

VOCs, SVOCs, and metals all have been detected in vadose zone soils within the HWSA. SVOCs and metals also have been detected in soils at elevated concentrations outside the HWSA. VOC contamination, while present to some degree throughout the HWSA, appears to be most significant at 3 to 5 feet bgs near borings HB-1 and SB102 (Figure 4.1 and Table 4.1). At this location, xylenes were detected at high levels both in 1988 (1,900 mg/kg at HB-1) and in 1997 (940 mg/kg at SB102). However, VOC concentrations at this same depth interval are significantly less at the bioventing MP boreholes installed approximately 10 to 30 feet from this area (Figure 4.1 and Table 4.7). At VW-1, which was installed adjacent to HB-1 and SB102, VOC contaminant levels at 8 to 9 feet bgs are generally several orders of magnitude less than those measured at SB102.

The highest SVOC concentrations in soils have generally been measured in surface soil samples collected at SS-3, SS-4, SU-44, and SU-45 outside the site fence near the western corner of the HWSA (Figure 3.1 and Appendix C). Because the shallow SVOC soil contamination extends beyond the HWSA boundaries, this contamination probably originated offsite. Similarly, significant metals concentrations in soil have been measured both on and offsite. The likely sources of these nonsite-related

contaminants are the former coal-fired power plant and coal storage pile west of the site. The HWSA is approximately 180 feet downwind of the coal-fired boiler smokestack and storage pile (Figure 1.2) and the association of SVOCs and metals is common in contamination resulting from the outfall of coal burning.

4.2.2 Groundwater Quality

In June/July 1997, following the installation of the additional groundwater monitoring wells (Section 4.1.2.1), comprehensive groundwater sampling was performed by IT (1997b) at 37 site area wells. Sampling was performed in accordance with sampling and analytical procedures prescribed in the February 1997 amended closure/post-closure plan (Parsons ES, 1997a). Samples were sent to Pace Analytical Services for analysis of VOCs, SVOCs, and metals. In addition, samples were analyzed both in the field and at the laboratory for various geochemical RNA indicators. VOC, SVOC, metals contaminant results are presented in this section, primarily based on the June/July sampling event; previous VOC groundwater contaminant data also are presented for comparison. Groundwater analytical data from the 1997 sampling events are provided in Appendix C, and maximum and 95-percent upper confidence limit (UCL) concentrations are presented in Appendix E. Geochemical data pertinent to the fate of groundwater contaminants is discussed in Section 4.4 and presented in Appendix C.

4.2.2.1 Metals in Groundwater

During the June/July 1997 sampling event, groundwater samples were collected from 18 site monitoring wells for analysis of total and dissolved inorganics. Groundwater samples were collected from the 10 newly installed wells (MW-101S, MW-101D, MW-102S, MW-102D, MW-103S, MW-103D, MW-104D, MW-105S, MW-105D, and MW-106D) and eight existing wells (MW-3, MW-4, MW-5, MW-6, MW-8, MW-9, MW-11, and MW-12). Inorganic concentrations in groundwater from the June/July 1997 sampling event are presented in Table 4.9, and elevated inorganic concentrations also are shown on Figure 4.5.

TABLE 4.9
METALS IN SHALLOW GROUNDWATER
JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Sample Location	Aluminum (µg/L)	Aluminum-D (µg/L)	Antimony (µg/L)	Antimony-D (µg/L)	Arsenic (µg/L)	Arsenic-D (µg/L)	Barium (µg/L)	Barium-D (µg/L)	Beryllium (µg/L)	Beryllium-D (µg/L)	Cadmium (µg/L)	Cadmium-D (µg/L)
MW-101D	150	52	40 U ^a	40 U	5.0 U	5.0 U	160	160	2.0 U	2.0 U	17	5.0 U
MW-101S	2200	46	40 U	40 U	8.7	19	180	180	2.0 U	2.0 U	14	19
MW-102S	150	110	40 U	40 U	7.8	14	270	260	2.0 U	2.0 U	17	16
MW-102D	150	47	40 U	40 U	5.0 U	5.0 U	180	180	2.0 U	2.0 U	11	12
MW-103D	72	89	40 U	40 U	9.9	14	200	200	2.0 U	2.0 U	17	11
MW-103S	81	41	40 U	40 U	6.6	5.0 U	94	94	2.0 U	2.0 U	5.0 U	5.0 U
MW-104D	130	40	40 U	40 U	5.0 U	6.6	140	140	2.0 U	2.0 U	5.0 U	19
MW-105D	90	40	40 U	40 U	5.0 U	6.9	170	180	2.0 U	2.0 U	34	5.0 U
MW-105S	99	51	40 U	40 U	5.0 U	6.9	360	360	2.0 U	2.0 U	9.7	8.4
MW-106D	150	44	40 U	40 U	13	10	100	99	2.0 U	2.0 U	11	16
MW-11	25 U	28	40 U	56	5.0 U	5.0 U	89	90	2.0 U	2.0 U	5.0 U	7.9
MW-12	46	26	40 U	40 U	5.0 U	5.0 U	82	82	2.0 U	2.0 U	9.7	3.0 U
MW-3	450	25 U	40 U	40 U	5.0 U	5.0 U	170	140	2.0 U	2.0 U	9.2	16
MW-4	76	36	40 U	40 U	5.0 U	5.0 U	110	110	2.0 U	2.0 U	5.0 U	7.8
MW-5	25 U	41	40 U	40 U	5.0 U	5.0 U	220	230	2.0 U	2.0 U	17	26
MW-6	25 U	26	40 U	57	5.0 U	5.0 U	61	62	2.0 U	2.0 U	8.2	16
MW-8	360	49	40 U	40 U	5.0 U	5.0 U	110	100	2.0 U	2.0 U	33	8.7
MW-9	92	63	40 U	40 U	5.0 U	5.0 U	44	43	2.0 U	2.0 U	5.0 U	5.0 U

Sample Location	Calcium (µg/L)	Calcium-D (µg/L)	Chromium (µg/L)	Chromium-D (µg/L)	Cobalt (µg/L)	Cobalt-D (µg/L)	Copper (µg/L)	Copper-D (µg/L)	Iron (µg/L)	Iron-D (µg/L)	Lead (µg/L)	Lead-D (µg/L)
MW-101D	110,000	110,000	5.0 U	5.0 U	10 U	10 U	6.7	6.4	2,300	2,100	2.0 U	2.9
MW-101S	100,000	97,000	5.0 U	5.0 U	10 U	10 U	9.6	6.3	7,400	4,300	2.0 U	4.3
MW-102S	110,000	110,000	5.0 U	5.0 U	10 U	10 U	5.3	7.7	5,700	5,700	2.1	2.0 U
MW-102D	110,000	120,000	5.0 U	5.0 U	10 U	10 U	4.4	3.4	2,900	3,000	2.0 U	2.0 U
MW-103D	120,000	110,000	5.0 U	5.0 U	10 U	10 U	4.6	5.3	1,900	1,900	2.0 U	2.9
MW-103S	90,000	90,000	5.0 U	5.0 U	10 U	10 U	5.3	4.8	1,500	1,400	2.0 U	3.3
MW-104D	110,000	110,000	5.0 U	5.0 U	10 U	10 U	5.3	3.0	1,400	1,200	2.0 U	4.2
MW-105D	110,000	100,000	5.0 U	5.0 U	10 U	10 U	3.9	6.2	2,600	2,500	2.0 U	2.1
MW-105S	100,000	100,000	5.0 U	5.0 U	10 U	10 U	4.6	5.4	2,600	2,700	2.0 U	2.8
MW-106D	110,000	110,000	5.0 U	5.0 U	10 U	10 U	5.8	6.4	1,300	1,000	2.0 U	2.0 U
MW-11	120,000	110,000	5.0 U	5.0 U	10 U	10 U	5.6	4.3	49	28	2.0 U	6.1
MW-12	130,000	130,000	5.0 U	5.0 U	10 U	10 U	3.9	3.0 U	46	34	2.0 U	2.0 U
MW-3	140,000	130,000	5.0 U	5.0 U	10 U	10 U	3.0 U	4.7	750	25 U	2.0 U	2.5
MW-4	130,000	120,000	5.0 U	5.0 U	10 U	10 U	3.3	3.4	63	48	2.0 U	2.0 U
MW-5	110,000	110,000	5.0 U	5.0 U	10 U	10 U	3.0 U	4.3	5,000	4,300	26	18
MW-6	140,000	130,000	5.0 U	5.0 U	10 U	10 U	3.0 U	3.4	44	25 U	2.0 U	2.0 U
MW-8	99,000	96,000	5.0 U	5.0 U	10 U	10 U	3.9	17	750	47	2.0 U	2.7
MW-9	210,000	210,000	5.0 U	5.0 U	10 U	10 U	3.0 U	3.0 U	200	28	2.0 U	3.2

TABLE 4.9 (Continued)
METALS IN SHALLOW GROUNDWATER
JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANG, OHIO

Sample Location	Magnesium (µg/L)	Magnesium-D (µg/L)	Manganese (µg/L)	Manganese-D (µg/L)	Mercury (µg/L)	Mercury-D (µg/L)	Nickel (µg/L)	Nickel-D (µg/L)	Potassium (µg/L)	Potassium-D (µg/L)	Selenium (µg/L)	Selenium-D (µg/L)
MW-101D	36,000	36,000	150	150	0.20 U	0.20 U	20 U	20 U	1,700	1,800	6.5	5.0 U
MW-101S	42,000	42,000	230	140	0.20 U	0.20 U	20 U	20 U	1,200	980	5.0 U	5.0 U
MW-102S	33,000	34,000	520	540	0.20 U	0.20 U	20 U	20 U	600 U	1,200	5.0 U	5.0 U
MW-102D	39,000	40,000	140	130	0.20 U	0.20 U	20 U	20 U	1,100	1,800	5.0 U	5.0 U
MW-103D	38,000	37,000	130	130	0.20 U	0.20 U	20 U	20 U	1,500	1,500	6.4	5.0 U
MW-103S	30,000	30,000	170	170	0.20 U	0.20 U	20 U	20 U	1,100	1,300	5.0 U	5.0 U
MW-104D	36,000	36,000	190	190	0.20 U	0.77	20 U	20 U	1,500	2,300	5.2	5.0 U
MW-105D	36,000	36,000	130	130	0.32	0.20 U	20 U	20 U	1,500	2,100	5.0 U	5.0 U
MW-105S	42,000	42,000	230	220	0.20 U	0.20 U	20 U	20 U	1,300	1,500	5.0 U	5.4
MW-106D	36,000	36,000	160	150	0.20 U	0.20 U	20 U	20 U	1,100	1,500	5.0 U	5.0 U
MW-11	36,000	36,000	10	13	0.20 U	0.20 U	20 U	20 U	1,400	1,100	5.0 U	5.0 U
MW-12	43,000	42,000	17	21	0.20 U	0.20 U	20 U	20 U	1,300	1,000	5.0 U	5.0 U
MW-3	29,000	28,000	6,700	200	0.24	0.20 U	20 U	20 U	900	840	5.0 U	5.0 U
MW-4	46,000	46,000	80	87	0.20 U	0.20 U	20 U	20 U	620	1,000	5.0 U	5.0 U
MW-5	32,000	32,000	430	400	0.20 U	0.20 U	20 U	20 U	600 U	720	9.8	5.0 U
MW-6	40,000	40,000	4.6	2.5	0.20 U	0.20 U	20 U	20 U	690	660	5.0 U	5.0 U
MW-8	32,000	31,000	130	3.4	0.26	0.20 U	20 U	20 U	600 U	600 U	5.0 U	5.0 U
MW-9	76,000	76,000	1,100	1,000	0.20 U	0.20 U	20 U	20 U	1,100	1,200	5.0 U	5.0 U

Sample Location	Silver (µg/L)	Silver-D (µg/L)	Sodium (µg/L)	Sodium-D (µg/L)	Thallium (µg/L)	Thallium-D (µg/L)	Vanadium (µg/L)	Vanadium-D (µg/L)	Zinc (µg/L)	Zinc-D (µg/L)
MW-101D	5.0 U	5.0 U	9,900	9,800	5.0 U	5.0 U	5.0 U	5.0 U	5.4	13
MW-101S	5.0 U	5.0 U	23,000	21,000	5.0 U	5.0 U	5.0 U	5.0 U	23	13
MW-102S	5.0 U	19	10,000	10,000	5.0 U	5.0 U	5.0 U	5.0 U	16	18
MW-102D	5.0 U	5.0 U	9,300	9,400	5.0 U	5.0 U	5.0 U	5.0 U	15	12
MW-103D	5.0 U	5.0 U	7,800	7,900	5.0 U	5.0 U	5.0 U	5.0 U	14	13
MW-103S	5.0 U	5.0 U	5,000	5,000	5.0 U	5.0 U	5.0 U	5.0 U	13	12
MW-104D	5.0 U	5.0 U	9,000	9,500	5.0 U	5.0 U	5.0 U	5.0 U	15	22
MW-105D	5.0 U	5.0 U	6,900	7,000	5.0 U	5.0 U	5.0 U	5.0 U	14	13
MW-106D	5.0 U	5.0 U	35,000	36,000	5.0 U	5.0 U	5.0 U	5.0 U	12	13
MW-11	5.0 U	5.0 U	5,600	5,500	5.0 U	6.2	5.0 U	5.0 U	4.0 U	20
MW-12	5.0 U	5.0 U	12,000	12,000	8.6	5.0 U	5.0 U	5.0 U	4.0 U	13
MW-3	5.0 U	5.0 U	11,000	11,000	9.9	5.0 U	5.0 U	5.0 U	60	11
MW-4	5.0 U	5.0 U	6,100	6,100	5.0 U	5.0 U	5.0 U	5.0 U	4.0 U	22
MW-5	5.0 U	5.0 U	13,000	12,000	5.8	5.0 U	5.0 U	5.0 U	4.0 U	19
MW-6	5.0 U	5.0 U	5,400	5,500	5.0 U	5.0 U	5.0 U	5.0 U	4.0 U	12
MW-8	5.0 U	5.0 U	4,000	4,000	10	5.0 U	5.0 U	5.0 U	4.0 U	20
MW-9	5.0 U	5.0 U	7,900	8,100	13	5.0 U	5.0 U	5.0 U	4.0 U	15

^a µg/L = micrograms per liter.

^b D = dissolved concentration of analyte.

^c U = analyte not detected; number shown represents the laboratory method detection limit.

Based on the June 1997 work plan (Parsons ES, 1997b) and previous groundwater sampling results, antimony, arsenic, beryllium, cadmium, lead, and thallium, are the most significant inorganic contaminants in site groundwater considering preliminary risk screening analysis. During the June/July 1997 sampling event, antimony was detected in the dissolved sample at two wells (57 $\mu\text{g/L}$ at MW-6 and 56 $\mu\text{g/L}$ at MW-11), but was not detected in any of the non-filtered samples. Arsenic was detected in five of the non-filtered samples and seven of the dissolved samples. The maximum total arsenic concentration was detected at MW-106D (13 $\mu\text{g/L}$) and the maximum dissolved arsenic concentration was detected at MW-101S (19 $\mu\text{g/L}$). Cadmium, both total and dissolved, was detected in 13 of the 18 wells. The two highest total cadmium concentrations were detected at MW-105D (34 $\mu\text{g/L}$) and MW-8 (33 $\mu\text{g/L}$). The maximum dissolved cadmium concentration was detected at MW-5 (26 $\mu\text{g/L}$). Total lead was detected in two site monitoring wells (26 $\mu\text{g/L}$ at MW-5 and 2.1 $\mu\text{g/L}$ at MW-102S), and dissolved lead was detected in 12 monitoring wells. As with total lead, the maximum dissolved lead concentration was detected at MW-5 (18 $\mu\text{g/L}$). Total thallium was detected in five site monitoring wells (the maximum concentration was 13 $\mu\text{g/L}$ at MW-9), and dissolved thallium was detected only at MW-11 (6.2 $\mu\text{g/L}$). Beryllium, total and dissolved, was not detected in any of the 18 samples. Manganese, while not previously identified as a significant groundwater contaminant (Parsons ES, 1997b), was detected above the 95-percent UCL background concentration of 1.34 mg/L (IT, 1997d) during the June/July 1997 sampling event. The maximum total manganese concentration (6.7 mg/L) was detected at MW-3. Dissolved manganese was not detected above background concentrations for any of the 18 samples.

4.2.2.2 SVOCs in Groundwater

Groundwater samples were collected in June/July 1997 from 32 site monitoring wells and analyzed for SVOCs by USEPA Method SW8270B. bis(2-Ethylhexyl)phthalate was detected in samples collected from six monitoring wells. The maximum detected concentration of bis(2-ethylhexyl)phthalate (22 $\mu\text{g/L}$) was detected in the sample from MW-105D, but this analyte also was detected in the associated QC

blank. Lower bis(2-ethylhexyl)phthalate concentrations also were detected in samples collected from MW-5, MW-12, ESMP-4S, ESMP-6D, and ESMP-13S. No other SVOCs were detected at more than one location, and most of these were present at near non-detect levels in the sample collected from ESMP-13S. In this sample, acenaphthene (5 $\mu\text{g/L}$), carbazole (6 $\mu\text{g/L}$), dibenzofuran (2 $\mu\text{g/L}$), fluoranthene (1 $\mu\text{g/L}$), fluorene (4 $\mu\text{g/L}$), and phenanthrene (2 $\mu\text{g/L}$) were detected. Other SVOC detections in groundwater include naphthalene (28 $\mu\text{g/L}$) and 2-methylnaphthalene (70 $\mu\text{g/L}$) at MW-5, and di-n-octylphthalate (4 $\mu\text{g/L}$) at MW-105D.

4.2.2.3 VOCs in Groundwater

During the June/July 1997 sampling event, samples were collected from 37 site monitoring wells and analyzed for VOCs by USEPA Method SW8260. Aromatic hydrocarbons (i.e., BTEX) and CAHs historically have been detected in groundwater samples collected from the site. The CAHs that historically have been detected are *cis*-1,2-DCE, *trans*-1,2-DCE, 1,1-DCE, 1,2-dichloroethane (DCA), TCE, and VC. The analytical results for these VOCs are presented in Table 4.10, and include groundwater sampling events conducted at the site between September 1988 and June/July 1997.

The approximate horizontal extent of BTEX in groundwater has been estimated based on various sampling events at the HWSA since February 1995. Figure 4.6 shows the estimated extent of total BTEX concentrations exceeding 5 $\mu\text{g/L}$. BTEX generally were detected in groundwater samples collected from the shallow sand and gravel interval (i.e., ESMP-13S, ESMP-16S, and MW-5). The highest total BTEX concentrations historically occur at ESMP-13S, which is located adjacent to one of the former UST cavities at the site. During the June/July 1997 sampling event, the total BTEX concentration at this location was 872 $\mu\text{g/L}$, and the benzene concentration was 670 $\mu\text{g/L}$. The vertical extent of contamination at this location was defined by the sample collected from ESMP-13D where total BTEX was not measured above detection limits. The ESMP-13S cluster is located downgradient from and adjacent to the four former 25,000-gallon USTs (Figure 4.2). The second highest concentration of BTEX

TABLE 4.10
BTEX AND CHLORINATED VOCs DETECTED IN SHALLOW GROUNDWATER
SEPTEMBER 1988 - JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Sample Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Total BTEX (µg/L)	Vinyl Chloride (µg/L)	1,1-DCE (µg/L)	T-1,2-DCE (µg/L)	C-1,2-DCE (µg/L)	1,2-DCE (total) (µg/L)	1,2-DCA (µg/L)	TCE (µg/L)
ESMP-1S	Feb-95	-- ^a	BLQ ^b	--	--	BLQ	--	--	--	--	--	--	--
ESMP-1D	Feb-95	--	BLQ	BLQ	--	BLQ	--	--	--	--	--	--	--
ESMP-2S	Feb-95	--	3.6	--	--	3.6	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-2D	Feb-95	--	1.05	--	--	1.05	--	--	1	BCL ^c	1	--	95.6
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	20
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	14
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	9
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	6.5
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	7.7
	Dec-96	--	--	--	1.5J ^d	1.5J	--	--	--	--	--	--	3J
	Mar-97	--	--	--	--	--	--	--	--	--	--	--	6
	Jun/Jul-97	--	--	--	--	--	--	--	--	BCL	BCL	--	4.4
ESMP-3S	Feb-95	--	--	--	--	--	--	--	--	--	--	--	1
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-3D	Feb-95	--	BLQ	--	--	BLQ	--	--	--	1.3	1.3	--	6.5
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	4.5J	4.5J	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-4S	Feb-95	--	BLQ	--	--	BLQ	1	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	22	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-4D	Feb-95	--	2.48	--	--	2.48	16	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	15	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	15	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	19	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	17	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	17	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	22	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	55E ^e	--	--	--	--	--	--
ESMP-5S	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-5D	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 4.10 (Continued)
 BTEX AND CHLORINATED VOCs DETECTED IN SHALLOW GROUNDWATER
 SEPTEMBER 1988 - JUNE/JULY 1997
 HAZARDOUS WASTE STORAGE AREA
 RICKENBACKER ANGB, OHIO

Sample Location	Sample Date	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethylbenzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)	Total BTEX ($\mu\text{g/L}$)	Vinyl Chloride ($\mu\text{g/L}$)	1,1-DCE ($\mu\text{g/L}$)	T-1,2-DCE ($\mu\text{g/L}$)	C-1,2-DCE ($\mu\text{g/L}$)	1,2-DCE (total) ($\mu\text{g/L}$)	1,2-DCA ($\mu\text{g/L}$)	TCE ($\mu\text{g/L}$)
ESMP-6S	Feb-95	--	3.13	--	--	3.13	NA	NA	NA	NA	NA	NA	NA
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-6D	Feb-95	--	--	--	--	--	1.7	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	2	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	1.9 J	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	1.7 J	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	2.8	--	--	--	--	--	--
ESMP-7S	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-7D	Feb-95	--	BLQ	--	--	BLQ	--	--	--	--	--	--	BCL
ESMP-8S	Feb-95	--	1.3	--	--	1.3	--	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	BCL
ESMP-8DD	Feb-95	--	BLQ	--	BLQ	BLQ	--	--	--	--	--	--	BCL
ESMP-9S	Feb-95	--	BLQ	--	--	BLQ	--	--	--	--	--	--	BCL
ESMP-9D	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-10S	Feb-95	--	BLQ	--	--	BLQ	--	--	--	--	--	--	1
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	6.4	6.4	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-10D	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-11D	Feb-95	BLQ	BLQ	BLQ	BLQ	BLQ	--	--	--	--	--	--	BCL
ESMP-12S	Mar-95	--	2.44	--	--	2.44	--	--	--	--	--	220	BCL
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	1200D ^a	--
ESMP-13S	Feb-95	424.18	22.41	237.09	279.58	963.26	2.7	1.3	300	228	528	--	45.6
	Aug-95	200	--	130	100	430	--	--	430	--	--	--	--
	Dec-95	270	8.9 J	140	90	508.9	--	--	230	180	410	--	--
	Mar-96	280	8.2 J	120	34	442.2	62	--	230	210	440	--	--
	Jun-96	300	6.7	120	50	476.7	120	--	190	200	390	--	--
	Sep-96	390	10	160	100	660	72	--	51	9.8	151	--	--
	Dec-96	510	25 J	190	77	777	41	--	--	--	--	--	--
	Mar-97	600	--	180	84	864	45	--	--	--	--	--	--
	Jun/Jul-97	670D	12	190E	--	872	--	--	--	--	--	25	--

TABLE 4.10 (Continued)
BTEX AND CHLORINATED VOCs DETECTED IN SHALLOW GROUNDWATER
SEPTEMBER 1988 - JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Sample Location	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Total BTEX (µg/L)	Vinyl Chloride (µg/L)	1,1-DCE (µg/L)	T-1,2-DCE (µg/L)	C-1,2-DCE (µg/L)	1,2-DCE (total) (µg/L)	1,2-DCA (µg/L)	TCE (µg/L)
ESMP-13D	Feb-95	--	--	BLQ	--	BLQ	--	--	--	--	--	--	--
ESMP-13D(D)	Feb-95	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
ESMP-14S	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-14S(D)	Feb-95	NA	NA	NA	NA	NA	--	--	--	--	--	--	--
ESMP-14D	Feb-95	--	--	--	--	--	1	--	2.2	2.2	2.2	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	4.1J	4.1J	4.1J	--	--
	Mar-96	--	--	--	--	--	--	--	5.8	5.8	5.8	--	--
	Jun-96	--	--	--	--	--	--	--	5	5	5	--	--
	Sep-96	--	--	--	--	--	2.1	--	8.5	--	8.5	--	--
	Dec-96	--	--	--	--	--	2.8	--	11	11	11	--	--
	Mar-97	--	--	--	--	--	4.8	--	15	15	15	--	--
	Jun/Jul-97	1.7	--	--	--	1.7	9.1	--	22	22	22	--	--
ESMP-14DD	Feb-95	--	BLQ	--	--	BLQ	--	--	--	--	--	--	BCL
ESMP-15S	Feb-95	--	1.08	--	--	1.08	--	--	--	--	--	1.5	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-15D	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-16S	Mar-95	89.18	BLQ	228.5	153.65	471.33	--	--	BCL	BCL	BCL	--	--
	Aug-95	23	--	23	7	53	--	--	--	--	--	--	--
	Dec-95	5	--	5	5	15	--	--	--	--	--	--	--
	Mar-96	18	--	--	--	18	--	--	--	--	--	--	--
	Jun-96	3.1J	--	--	--	3.1J	--	--	--	--	--	--	--
	Sep-96	11	--	--	--	11	--	--	--	--	--	--	--
	Dec-96	9.1	--	--	--	9.1	--	--	--	--	--	--	--
	Jun/Jul-97	1.7	--	--	--	1.7	--	--	--	--	--	--	--
ESMP-16D	Mar-95	6.46	BLQ	26.87	62.03	95.36	--	--	BCL	BCL	BCL	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	3.8J	3.8J	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
ESMP-17S	Feb-95	--	--	--	--	--	1570	11.7	152	4913	5065	--	BCL
	Aug-95	--	--	--	--	--	930E	--	7730E	--	7730E	--	--
	Dec-95	--	--	--	--	--	1200	9.9	130	4200	4330	--	--
	Mar-96	--	--	--	--	--	670	--	130	2800	2930	--	--
	Jun-96	--	--	--	--	--	500	5.7	93	3000	3093	--	--
	Sep-96	--	--	--	--	--	460E	5	1800E	78	1878E	--	--
	Dec-96	--	--	--	--	--	210D	2.3J	48	1500E	1548E	--	--
	Mar-97	--	--	--	--	--	49E	2.2	29E	700E	729E	--	--
	Jun/Jul-97	--	--	--	--	--	600E	3.9	--	1100E	1100E	--	--
MW-1	Sep-88	94	--	--	--	--	--	--	--	--	--	--	--
	Feb-90	560	--	110	121	--	--	--	--	--	--	--	--

TABLE 4.10 (Continued)
BTEX AND CHLORINATED VOCs DETECTED IN SHALLOW GROUNDWATER
SEPTEMBER 1988 - JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANG, OHIO

Sample Location	Sample Date	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethylbenzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)	Total BTEX ($\mu\text{g/L}$)	Vinyl Chloride ($\mu\text{g/L}$)	1,1-DCE ($\mu\text{g/L}$)	T-1,2-DCE ($\mu\text{g/L}$)	C-1,2-DCE ($\mu\text{g/L}$)	1,2-DCE (total) ($\mu\text{g/L}$)	1,2-DCA ($\mu\text{g/L}$)	TCE ($\mu\text{g/L}$)
MW-2	Sep-88	--	--	--	--	--	--	--	--	--	--	--	--
	Feb-90	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-91	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-95	BLQ	BLQ	BLQ	BLQ	BLQ	--	--	--	--	--	--	--
	Sep-96	--	--	--	3.2J	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-97	--	--	--	--	--	--	--	--	--	--	--	--
MW-3	Jun/Jul-97	--	--	--	--	--	--	4.8	--	4.8	4.8	--	--
	Sep-88	--	--	--	--	--	--	--	--	--	--	--	44
	Feb-90	--	--	--	--	--	--	--	--	--	--	--	7
	Oct-91	--	--	--	--	--	--	--	--	--	--	--	10
	Feb-95	BLQ	BLQ	BLQ	BLQ	BLQ	--	--	BLC	BLC	BLC	--	1
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	5J
	Dec-96	--	--	--	--	--	--	--	--	--	--	--	0.53J
	Mar-97	--	--	--	--	--	--	--	--	--	--	--	1.6
MW-4	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Feb-90	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-91	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-95	BLQ	BLQ	BLQ	BLQ	BLQ	--	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	6.2	6.2	--	--	--	--	--	--	--
	Mar-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
MW-5	Jun/Jul-97	--	41.94	317.97	375.93	753.03	--	--	--	--	--	--	--
	Mar-95	17.19	--	--	--	--	--	--	--	--	--	--	--
	Aug-95	--	15	170	210	395	--	--	--	--	--	--	--
	Dec-95	--	12 J	140	190	342	--	--	--	--	--	--	--
	Mar-96	--	4.8 J	54	100	158.8	--	--	--	--	--	--	--
	Jun-96	--	13J	190	210	413	--	--	--	--	--	--	--
	Sep-96	--	7.6	150	180	337.6	--	--	--	--	--	--	--
	Dec-96	--	--	230	290	520	--	--	--	--	--	--	--
	Mar-97	7.9J	14	210	218	449.9	--	--	--	--	--	--	--
	Jun/Jul-97	--	9.4	260D	280D	549.4	--	--	--	--	--	--	--

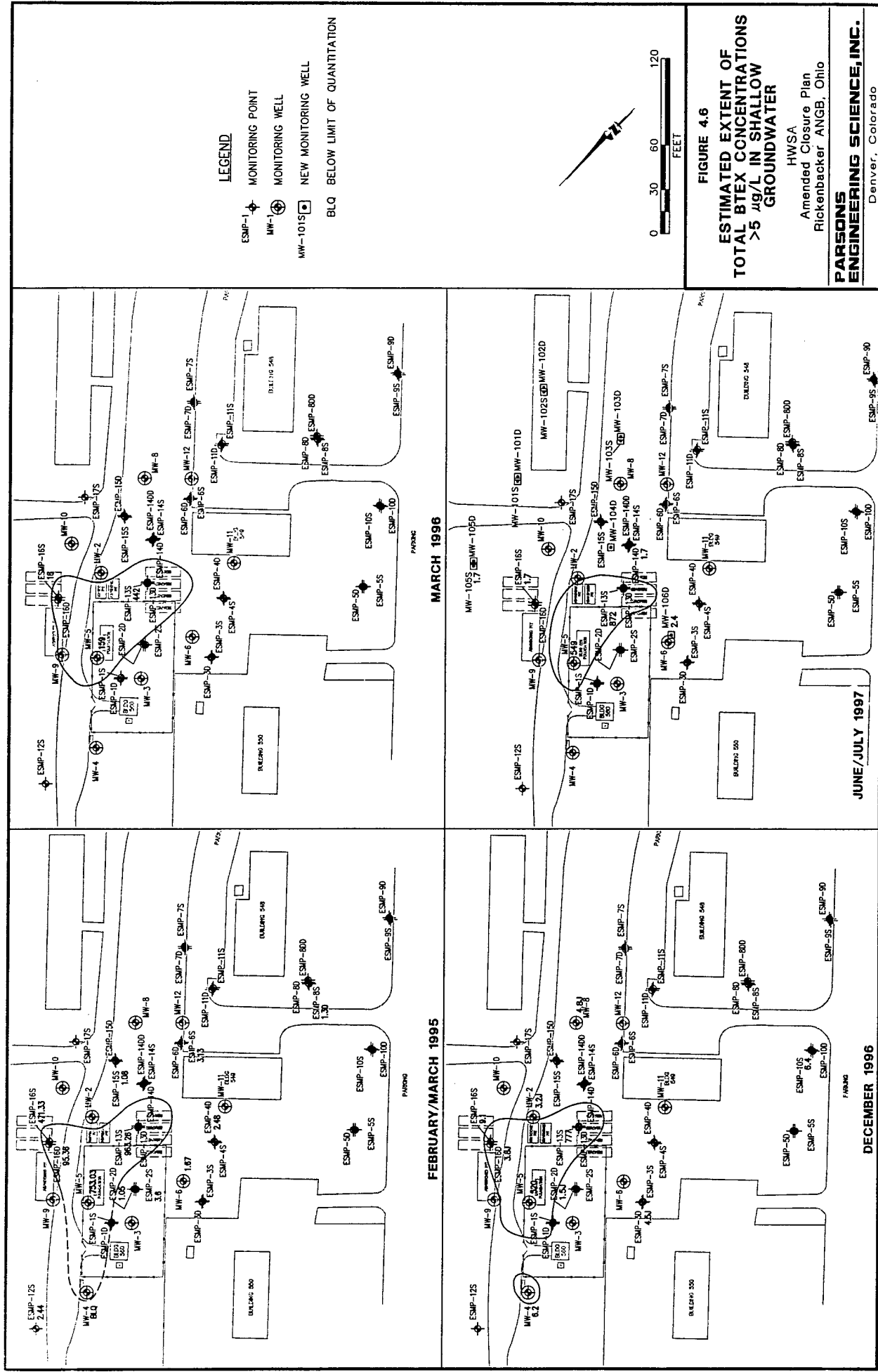
TABLE 4.10 (Continued)
BTEX AND CHLORINATED VOCs DETECTED IN SHALLOW GROUNDWATER
SEPTEMBER 1988 - JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANG, OHIO

Sample Location	Sample Date	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethylbenzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)	Total BTEX ($\mu\text{g/L}$)	Vinyl Chloride ($\mu\text{g/L}$)	1,1-DCE ($\mu\text{g/L}$)	T-1,2-DCE ($\mu\text{g/L}$)	C-1,2-DCE ($\mu\text{g/L}$)	1,2-DCE (total) ($\mu\text{g/L}$)	1,2-DCA ($\mu\text{g/L}$)	TCE ($\mu\text{g/L}$)
MW-6	Feb-90	--	--	--	--	--	--	--	8	--	8	--	78
	Oct-91	--	--	--	--	--	--	--	--	--	190	--	2000
	Feb-95	NA	NA	NA	NA	NA	21.9	6.5	43.2	794	837.2	--	9580
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	770
	Dec-95	--	--	--	--	--	--	--	--	27	27	--	180
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	11
	Jun-96	--	--	--	--	--	--	--	1.7J	26	28J	--	560
	Sep-96	--	--	--	--	--	--	--	18	--	18	--	220
	Dec-96	--	--	--	--	--	--	--	--	10	10	--	130
	Jun/Jul-97	--	--	--	--	--	--	--	--	1.8	1.8	--	24
MW-7	Feb-90	200	--	90	70	--	--	--	--	--	--	--	--
	Oct-91	19	2J	62	36	--	17	--	--	--	--	--	--
MW-8	Feb-90	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-91	--	--	--	--	--	--	--	--	--	--	--	--
	Feb-95	BLQ	--	--	--	BLQ	--	--	--	--	--	--	BCL
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	4.8J	--	--	--	--	--	--	--
	Mar-97	--	--	--	--	--	--	--	--	--	--	--	--
MW-9	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Feb-90	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-91	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-95	--	--	--	--	--	--	--	--	--	--	--	--
MW-10	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Oct-91	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-95	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
MW-11	Oct-91	--	--	--	--	--	--	--	--	--	--	--	--
	Feb-95	--	--	--	--	--	--	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 4.10 (Continued)
BTEX AND CHLORINATED VOCs DETECTED IN SHALLOW GROUNDWATER
SEPTEMBER 1988 - JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANG, OHIO

Sample Location	Sample Date	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethylbenzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)	Total BTEX ($\mu\text{g/L}$)	Vinyl Chloride ($\mu\text{g/L}$)	1,1-DCE ($\mu\text{g/L}$)	T-1,2-DCE ($\mu\text{g/L}$)	C-1,2-DCE ($\mu\text{g/L}$)	1,2-DCE (total) ($\mu\text{g/L}$)	1,2-DCA ($\mu\text{g/L}$)	TCE ($\mu\text{g/L}$)
MW-12	Oct-91	--	--	--	--	BLQ	--	--	--	--	--	--	--
	Feb-95	--	BLQ	--	--	BLQ	--	--	--	--	--	--	--
	Aug-95	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-95	--	--	--	--	--	--	--	--	--	--	--	--
	Mar-96	--	--	--	--	--	--	--	--	--	--	--	--
	Jun-96	--	--	--	--	--	--	--	--	--	--	--	--
	Sep-96	--	--	--	--	--	--	--	--	--	--	--	--
	Dec-96	--	--	--	--	--	--	--	--	--	--	--	--
MW101S	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	14	--	4.1	29E	33.1E	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
MW103D	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
MW104D	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	1.7	--	--	--	1.7	--	--	--	--	--	--	--
MW105S	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
MW105D	Jun/Jul-97	--	--	--	--	--	--	--	--	--	--	--	--
	Jun/Jul-97	2.4	--	--	--	2.4	--	14	--	1200E	1200E	--	1500D

a/ -- = not detected.
b/ BLQ = below limit of quantitation.
c/ BCL = below calibration limit (1.0 mg/L).
d/ J = compound detected, but below the laboratory reporting limit; value shown represents a laboratory estimated concentration.
e/ E = concentration exceeded upper calibration standard; value shown represents an estimated concentration.
f/ NA = not analyzed.
g/ D = compound analyzed at a secondary dilution factor.



was measured at MW-5 (549 $\mu\text{g/L}$), where mobile LNAPL has been observed in the past and where the mobile LNAPL thickness in February 1995 was measured as 0.35 foot. Analysis of a sample of the free product collected from MW-5 during the February 1995 sampling event indicated a total BTEX concentration of 627 $\mu\text{g/L}$ with a nondetectable quantity of benzene, indicating a severely weathered product (Parsons ES, 1997a). Mobile LNAPL thickness at MW-5 ranged from a sheen to 0.1 foot during 1996 quarterly monitoring (IT, 1997a) and a sheen was observed during sampling performed in June/July 1997.

Figure 4.6 illustrates that the dissolved BTEX plume does not appear to be expanding in areal extent over this 1995 to 1997 monitoring period. Dissolved BTEX concentrations at ESMP-16S have consistently decreased during this period, and it appears that BTEX concentrations are generally decreasing, or remaining stable, throughout the plume without significant horizontal or vertical migration. Data collected at the site since February 1995 suggest that natural chemical attenuation processes, specifically biodegradation, are reducing BTEX concentrations at this site. RNA of these petroleum constituents in groundwater is discussed further in Section 4.4.

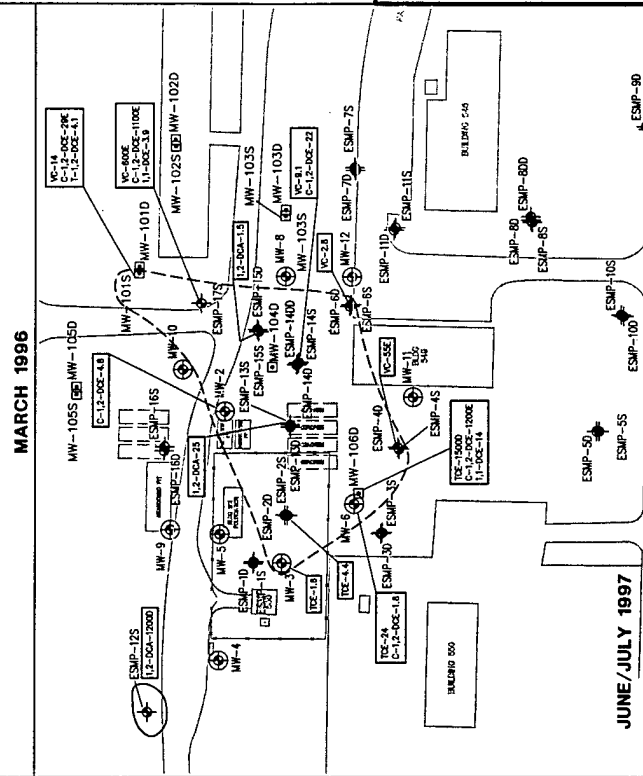
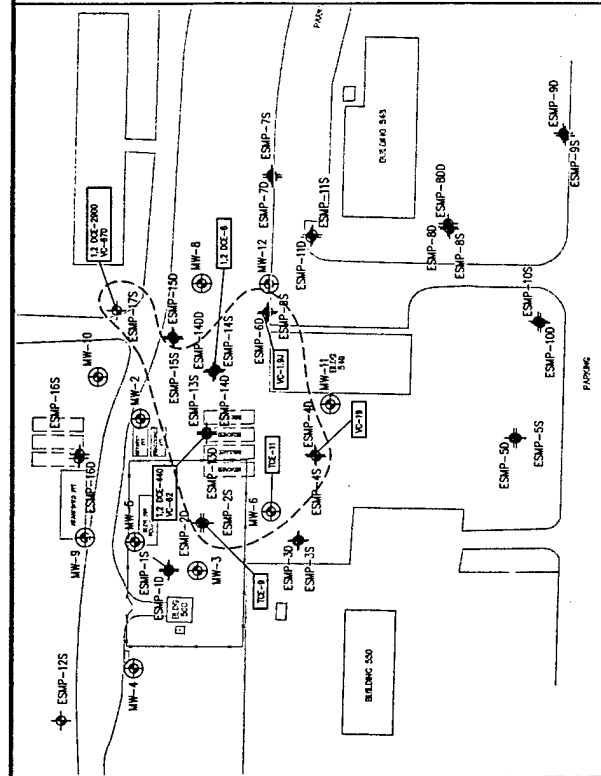
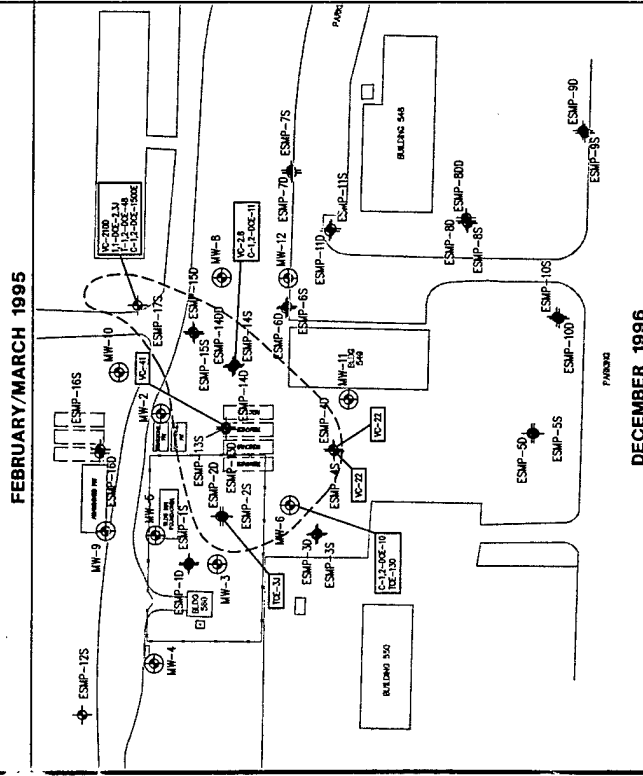
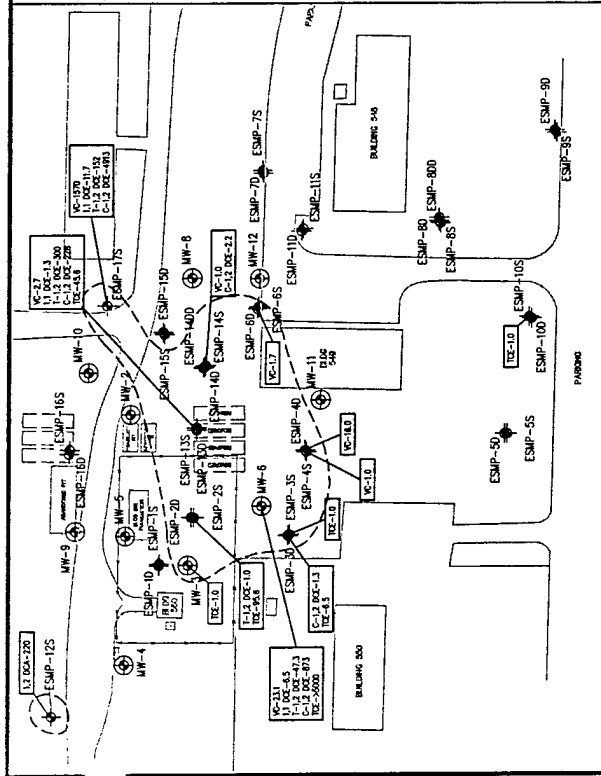
In addition to BTEX, CAHs have been historically detected in groundwater samples collected at and near the HWSA. Prior to the installation of several groundwater monitoring points in February/March 1995 (Section 3.1.1), elevated chlorinated VOC concentrations were routinely detected in samples collected from MW-3 and MW-6 (Table 4.10). Groundwater sampling performed subsequent to the groundwater monitoring point installation has shown elevated CAH concentrations in groundwater collected from ESMP-4D, ESMP-13S, and ESMP-17S. All five of these monitoring wells/points are screened in the sand and gravel zone approximately 14 to 18 feet bgs (Figures 2.5 and 2.6). CAHs have been detected in ESMP-14D, which is screened in the deeper sand seam at approximately 21 to 25 feet bgs; however, no VOCs were detected from ESMP-14DD (which is screened in the basal clay at approximately 26 to 29 ft bgs) during the February/March 1995 sampling event. The areal extent of CAHs

in groundwater, considering sampling results from the last 2 years of site monitoring, is shown on Figure 4.7.

Historically, the highest chlorinated VOC concentrations consistently have been measured in groundwater samples collected from ESMP-17S; however, elevated CAH concentrations also were detected in June/July 1997 samples collected from newly installed MW-106D and ESMP-12S. At MW-106D, TCE was detected at 1,500 $\mu\text{g/L}$, *cis*-1,2-DCE was detected at 1,200 $\mu\text{g/L}$, and 1,1-DCE was detected at 14 $\mu\text{g/L}$. At ESMP-12S, 1,2-DCA was detected at 1,200 $\mu\text{g/L}$. During this same sampling event, VC (600 $\mu\text{g/L}$), 1,1-DCE (3.9 $\mu\text{g/L}$), and *cis*-1,2-DCE (1,100 $\mu\text{g/L}$) were detected at ESMP-17S. Chlorinated VOCs also were detected in the sample collected from newly installed MW-101S. At this well, VC (14 $\mu\text{g/L}$), *cis*-1,2-DCE (29 $\mu\text{g/L}$), and *trans*-1,2-DCE (4.1 $\mu\text{g/L}$) were detected.

The CAH results from the June/July 1997 sampling event further define the extent of groundwater contamination in the vicinity of the HWSA. MW-106D is screened from approximately 17.5 to 22.5 ft bgs and was installed near MW-6 to evaluate the VOC contamination in the lower sand seam, above the basal clay layer. Other lower sand seam monitoring points in which chlorinated VOCs have been detected are ESMP-6D (VC detected at 2.8 $\mu\text{g/L}$) and ESMP-14D (*cis*-1,2-DCE detected at 22 $\mu\text{g/L}$). Lesser chlorinated VOC concentrations at these two groundwater MPs, combined with repeated non-detect measurements at ESMP-3D, suggest that the elevated concentrations detected at MW-106D are localized, and minimal, if any, migration of contaminants is occurring within this zone.

Minimal groundwater sampling has been performed at ESMP-12S since its installation in early 1995; however, 1,2-DCA was detected during both the March 1995 sampling event (at 220 $\mu\text{g/L}$) and the June/July 1997 comprehensive sampling event (1,200 $\mu\text{g/L}$). ESMP-12S is screened from approximately 12 to 16 feet bgs in the same upper sand seam as ESMP-4D, ESMP-13S, and ESMP-17S, but groundwater elevation data for this point (Tables 2.2 and 4.4) consistently indicate that water is



LEGEND

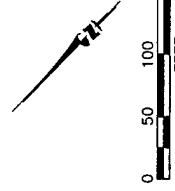


FIGURE 4.7
CHLORINATED
VOCs ($\mu\text{g/L}$) IN SHALLOW
GROUNDWATER

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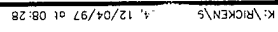
present at very shallow depths (as little as 0.40 ft bgs in March 1996). Based on the established easterly groundwater flow in the upper sand seam (Figures 2.7, 2.8, and 4.2) and typical depths to water (8 to 10 feet bgs), it does not appear that the VOC contamination evident in samples collected from ESMP-12S originated from within the HWSA.

Chlorinated VOCs detected in newly installed downgradient well MW-101S indicate that the downgradient extent of the CAH plume within the upper sand seam has not been completely delineated. While VC and 1,2-DCE (*cis*- and *trans*-) were detected at MW-101S, contaminant concentrations are 1 to 2 orders of magnitude less than concentrations detected in the June/July 1997 sample from ESMP-17S. Based on the relatively short distance between ESMP-17S and MW-101S (approximately 35 feet), and the significant difference in contaminant concentrations, it is anticipated that the leading edge of the chlorinated VOC plume does not extend far past MW-101S.

The most prevalent chlorinated VOC detected at the HWSA is VC. Vinyl chloride is a degradation product of DCE, which in turn is a degradation product of TCE. During the June/July 1997 sampling event, VC was detected at ESMP-4D (55 µg/L), ESMP-6D (2.8 µg/L), ESMP-14D (9.1 µg/L), ESMP-17S (600 µg/L), and MW-101S (14 µg/L). The estimated areal extent of VC in groundwater during the June/July 1997 sampling event is shown on Figure 4.8. The prevalence of VC at this site indicates that CAH degradation is occurring through reductive dehalogenation. The historical contaminant data (Table 4.10) suggest that VC is not accumulating in site groundwater, and appears to be slowly degrading. Conversely, total 1,2-DCE and TCE concentrations generally appear to be decreasing in site monitoring wells. Further analysis of chemical fate in groundwater is provided in Section 4.4.

4.3 TREATABILITY TESTING RESULTS

As part of the 1997 assessment activities, air injection bioventing and air sparging treatability tests were performed to evaluate the effectiveness of these source reduction technologies at remediating contaminated soils near Building 560 and groundwater



HWSA
Amended Closure Plan
Rickenbacker ANGB, Ohio

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downgradient from the site near ESMP-17S (Figure 4.1). In the event that risk reduction through source area treatment of soils and/or groundwater proved necessary considering future land use and findings of the risk assessment (Section 5), treatability testing results would be used to design the remedial approach.

Bioventing and air sparging treatability tests at the HWSA were initiated by IT (1997c) in August 1997 following installation of the bioventing and air sparging wells/monitoring points in June 1997. Treatability testing procedures and methods as outlined in the June 1997 additional assessment activities work plan (Parsons ES, 1997b) were generally followed except where site conditions prevented adherence to these procedures. This section reviews the preliminary results of the treatability testing effort. A more detailed summary of testing results and system effectiveness will be presented by IT (1997c) in the treatability testing results report for the HWSA.

4.3.1 Bioventing Treatability Test Objective and Results

The bioventing pilot-scale system was installed near Building 560 because of the elevated concentrations of petroleum hydrocarbons (primarily ethylbenzene and xylenes) present in vadose zone soils in the vicinity of borings HB-1 (Section 4.1.1.1) and SB102 (Table 4.1). In addition, if bioventing treatment of vadose zone soils in this area proved to be effective, it was presumed that extended operation of the pilot-scale system would provide incremental risk reduction without hindering the ongoing biodegradation of CAHs in groundwater. Conversely, a bioventing system installed and operated closer to the four former USTs (47 through 50) might alter the reducing groundwater conditions favorable for reductive dehalogenation of chlorinated VOCs, and/or diminish the supply of fuel hydrocarbons which may be acting as a carbon source for microbial growth and biodegradation of CAHs in groundwater. Air injection VW and MP completion details for the bioventing system and a cross section of the system configuration are presented in Table 4.5 and on Figure 4.3.

4.3.1.1 Soil Gas Sampling

Following installation of the bioventing VW and MPs, initial soil gas samples were collected to establish baseline conditions within vadose zone soils in this area. Soil gas samples were collected from the shallow and deep MP screens at VWMP-1, VWMP-2, and VWMP-3 and field screened for oxygen, carbon dioxide, and VOC concentrations. Soil gas samples from these locations also were sent to Air Toxics, Ltd., in Folsom, California for analysis of VOCs by USEPA Method TO-14. The initial field screening and laboratory analytical soil gas results are presented in Tables 4.11, and 4.12, respectively.

Soil gas results from installed vapor monitoring points (Table 4.11) suggest that vadose zone soils near Building 560 are oxygenated and may not benefit significantly from air injection bioventing treatment. Although some oxygen depletion has occurred, soil gas samples had oxygen concentrations greater than 5 percent, which is generally considered to be sufficient for aerobic degradation of petroleum hydrocarbon contaminants. VOCs were detected by PID in soil gas samples and the most significant concentration of VOCs were detected from the VWMP-1D sample. Elevated carbon dioxide concentrations in soil gas also suggest that some natural hydrocarbon biodegradation is occurring (i.e., that carbon dioxide is being created as an aerobic biodegradation byproduct).

Laboratory soil gas analytical results (Table 4.12) suggest that significant concentrations of VOCs, including ethylbenzene and xylenes, are present in vadose zone soils near Building 560. Laboratory results support the elevated PID readings measured in the field at VWMP-1D. Ethylbenzene and xylenes concentrations were greatest at VWMP-1D, which is located approximately 8 feet bgs (Figure 4.3) and approximately 10 feet from VW-1, and soil borings HB-1, and SB102 (Figure 4.1). Ethylbenzene and xylenes concentrations generally lessen with increasing distance from this apparent source area and decrease with depth at VWMP-2 and VWMP-3.

TABLE 4.11
INITIAL SOIL GAS FIELD RESULTS
AUGUST 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Monitoring Point	Oxygen (percent)	Carbon Dioxide (percent)	PID ^{a/} (ppmv) ^{b/}
VWMP-1S	20.9	0.3	25.8
VWMP-1D	13.5	5.4	100
VWMP-2S	11.8	6.7	23.7
VWMP-2D	15.5	4.2	7.0
VWMP-3S	18.6	1.3	25.2
VWMP-3D	6.4	6.7	8.1
SWVZ-4	17.8	4.2	2.3

^{a/} PID = photoionization detector measurements of volatile organics
using an Hnu DL-101.

^{b/} ppmv = parts per million, volume per volume.

TABLE 4.12
INITIAL SOIL GAS ANALYTICAL RESULTS
AUGUST 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Analyte	Sample Location ^{a/}						
	VWMP-1S	VWMP-1D	VWMP-2S	VWMP-2D	VWMP-3S	VWMP-3D	VZMP-4
Benzene	-- ^{b/}	--	--	--	--	--	--
Ethylbenzene	2,700	61,000	4,200	460	1,800	660	17
Toluene	41	--	--	--	--	--	--
Xylenes	16,500	157,500	14,660	1,530	6,370	2,760	71.5
Methylene Chloride	42	--	--	--	--	--	--
cis-1,2-Dichloroethene	--	--	--	--	--	--	4.7
1,1,2,2-Tetrachloroethane	--	--	--	--	--	--	4.7
1,2,4-Trimethylbenzene	58	--	--	11	--	--	--
Acetone	5,900	--	--	68	--	--	--
2-Propanol	240	--	--	--	--	--	--
2-Butanone	2,400	--	22,000	680	10,000	3,400	--
Tetrahydrofuran	1,800	4,100	56,000	1,400	76,000	16,000	370
Ethanol	300	--	--	--	--	--	--

Note: Samples analyzed by USEPA Method TO-14. All results in parts per billion, volume per volume.

a/ Bioventing system sample locations, except VZMP-4, which is a sparge point.

b/ -- = Not detected.

Similar to the difficulty encountered during Geoprobe® soil gas sample collection in May 1997, tight vadose zone soils (clay and silt) and high soil moisture content hindered soil gas sample collection, and may have resulted in some ambient air leaking into the sampling train and diluting the samples. In addition, all but one of the MP screens produced water during sample extraction, and soil gas samples only could be collected by inserting a water trap in the sampling train.

4.3.1.2 Air Permeability, Radius of Influence, and *In Situ* Respiration Testing

Following collection of the initial soil gas samples, air permeability and radius-of-influence testing was performed using a temporary power supply and a positive-displacement blower. The objective of the testing was to determine the pressure influence and the extent of the subsurface that could be oxygenated by air injection into VW-1. During the testing, pressure response was measured at each MP screened interval with differential pressure gauges to determine the region influenced by the unit. Soil gas oxygen concentrations also were measured at each MP screen to evaluate oxygen radius of influence. The permeability test was performed at various flow rates to determine the optimum rate for the system.

Based on conversations with IT (1997e), no pressure response was indicated at any of the MPs, except when the air flow injection pressure was increased to more than 90 inches of water. At this injection pressure, pressure influence was indicated only at VWMP-1S, located approximately 10 feet from the point of air injection (VW-1). Initial high concentrations of oxygen at this point, prevented determination of oxygen influence. An *in situ* respiration test to evaluate oxygen utilization and aerobic biodegradation of hydrocarbon contaminants by soil microbes was not performed because of the difficulty in injecting air into this moist, low-permeability soil.

4.3.1.3 Discussion and Conclusions

Results obtained from the bioventing treatability test were limited and did not support bioventing as an effective means of remediating vadose zone soils within the HWSA. While elevated concentrations of VOCs appear to be present both in soil and

soil gas, tight, impermeable, wet vadose zone soils prevented collection of conclusive soil gas samples and prevented performance of treatability tests critical for bioventing system design and long-term operation. Bioventing data available for 145 Air Force sites, suggest that a combination of high soil moisture content and fine-grained soils (silt and clay) can prevent bioventing from being a feasible technology (AFCEE, 1996b). If it is determined that contaminated source area soils within the HWSA require remediation, bioventing does not appear to be a viable technology for further consideration. Further information regarding the bioventing treatability test at the HWSA is provided by IT (1997c).

4.3.2 Air Sparging

Air sparging was conducted to evaluate the effectiveness of this technology to provide an oxygenated barrier to downgradient migration of CAHs (e.g., VC). Two air sparging treatability tests, one continuous air injection test and one pulsed air injection test, were conducted near ESMP-17 to confirm the effectiveness of the technology (Figure 4.1). Sparge well/MP completion details for the air sparging system and a cross section of the system configuration are presented in Table 4.8 and on Figure 4.4.

Initial treatability testing was performed in August 1997. Results from the continuous air injection and pulsed air injection tests were inconclusive. An extended treatability test was initiated in September 1997 to evaluate the long-term effectiveness of pulsed air injection in this area. Extended testing was completed in December 1997 and no increase in DO concentrations at the various MP screened intervals was apparent. In addition, quarterly groundwater sampling results from December 1997 indicate that dissolved CAH contaminant concentrations in the vicinity of the sparging system were not reduced by the extended testing (IT, 1998). Results of the air sparging treatability testing are further discussed in the Soil and Groundwater Treatability Test Report (IT, 1997c).

4.4 CHEMICAL FATE IN GROUNDWATER

This section estimates the effects natural chemical attenuation processes have had and may have on the migration, mass, concentration, persistence, and toxicity of various dissolved contaminants in groundwater, especially petroleum hydrocarbons and chlorinated solvents. Inorganics (metals) also are considered. These processes must be evaluated when determining whether a compound poses or has the potential to pose, an actual risk to human health and the environment. If the contaminant is not likely to migrate to a potential receptor, the contaminant poses no risk.

Several physical/chemical and biological processes influence how a chemical behaves in groundwater, and the role these processes play is in turn influenced by the chemical characteristics of each particular contaminant. The most important mechanisms affecting chemical fate in groundwater include sorption, dispersion, dilution from recharge, abiotic chemical reactions, and biological degradation. Sorption, dispersion, and dilution are nondestructive attenuation mechanisms that will limit contaminant migration and possibly decrease contaminant concentrations without a permanent reduction in contaminant mass. Conversely, destructive mechanisms such as abiotic chemical reactions and biological degradation typically result in loss of contaminant mass. However, the daughter products of some of these reactions may also be considered contaminants (e.g., DCE and VC are produced via biological dehalogenation of TCE). The positive effects of these natural processes on reducing the actual mass of contaminants and/or minimizing the extent of contaminant migration in groundwater has been termed remediation by natural attenuation (RNA).

4.4.1 Nondestructive Attenuation Mechanisms

The relative solubility, sorptive nature, and volatility of a chemical can govern the effectiveness of nondestructive chemical attenuation processes, particularly sorption. Dispersion and dilution from recharge are more dependent upon the physical hydrogeologic setting encountered at a given site.

4.4.1.1 Solubility and Sorption

The water solubility of a chemical species defines how that particular chemical could partition (leach) from a contaminant source and dissolve into and migrate with groundwater. For example, benzene is fairly water soluble relative to the heavier organics and to most inorganics. Consequently, even though benzene may make up a low mass fraction of the initial source of contamination, it will preferentially leach from residual LNAPLs present in soils and migrate as dissolved contamination (Lyman *et al.*, 1992). The differences in solubility between benzene and other fuel-related compounds is the cause of the disproportionate effect that benzene can have on groundwater quality in comparison to other hydrocarbons commonly found in fuel. For chlorinated compounds, solubility and mobility are controlled by the number of chlorine atoms and carbon atoms in the compounds. For example, TCE and PCE are less mobile relative to other chlorinated ethenes such as DCE and VC. Usually the less soluble compounds become adsorbed or occluded in the soils and have relatively low mobility.

For inorganic compounds such as lead and arsenic, the relative solubility can also be a function of environmental conditions. The solubility of these types of compounds can change as the groundwater becomes more or less reducing, more or less acidic, or more or less saturated with other compounds. For example, under highly reducing conditions, such as those found when organic contamination is present, compounds such as arsenic, manganese, and iron persist as species with low oxidizing potential (e.g., Masscheleyn *et al.*, 1991a, and 1991b). These reduced species are generally more soluble, which means that the compounds desorb from the solid soil matrix and are available to be transported as dissolved constituents. Consequently, localized changes in environmental conditions can dramatically affected the solubility (and therefore the concentration of a contaminant in solution) of certain inorganic compounds. As soluble inorganics migrate into more oxidizing environments, they often precipitate or stabilize as metal hydroxides and are then naturally removed from the groundwater.

Sorptive properties also govern how a chemical is attenuated in soil and groundwater. Most of the contaminants or potential contaminants detected at the HWSA sorb to that portion of the soil matrix that is composed of organic carbon and fine clay particles. If a contaminant can be strongly sorbed to organic carbon and/or clay particles in the aquifer matrix, the compound will be less mobile and less likely to be transported great distances from the source area. Benzene is considered the most mobile of the BTEX compounds (Abdul *et al.*, 1987), but it does sorb slightly to soils. The other BTEX compounds sorb more strongly, although they too are relatively mobile when compared to other compounds present in fuel mixtures. Heavier fuel hydrocarbons such as naphthalene sorb even more strongly to the soil matrix, and migration of those compounds tends to be limited in both soil and groundwater. As noted above, heavier and more chlorinated solvents such as PCE and TCE will sorb more strongly than DCE, DCA, or VC. In general, VC sorbs so weakly that it is not effectively attenuated by sorption and is thus seen further downgradient from a source area than are TCE and DCE. Sorption of metals detected in HWSA groundwater will likely be dependent on redox and pH conditions.

4.4.1.2 Volatilization

Volatilization can potentially remove contaminants from a groundwater system. In general, factors affecting the volatilization of contaminants from groundwater into soil gas include the contaminant concentration, the change in contaminant concentration with depth, the Henry's Law constant and diffusion coefficient of the compound, mass transport coefficients for the contaminant in both water and soil gas, and the temperature of the water (Larson and Weber, 1994). Partitioning of a contaminant between the liquid phase and the gaseous phase is governed by Henry's Law. Thus, the Henry's Law constant of a chemical determines the tendency of a contaminant to volatilize from groundwater into the soil gas. With the exception of VC, the physiochemical properties of chlorinated solvents and the BTEX compounds give them relatively low Henry's Law constants.

Because of the small surface area of the groundwater flow system exposed to soil gas, volatilization of chlorinated solvents and BTEX compounds from groundwater is a relatively slow process that, in the interest of being conservative, generally can be ignored as a significant attenuation process. Chiang *et al.* (1989) demonstrated that less than 5 percent of the mass of dissolved BTEX is lost to volatilization in the saturated groundwater environment. Moreover, Rivett (1995) observed that for plumes more than about 3 feet below the air/water interface, little, if any, solvent concentrations will be detectable in soil gas due to the downward groundwater velocity in the vicinity of the water table. This suggests that for portions of plumes more than 3 feet below the water table, very little, if any, mass will be lost due to volatilization. In addition, vapor transport across the capillary fringe can be very slow (McCarthy and Johnson, 1992), thus further limiting mass transfer rates. Because of this, the impact of volatilization on dissolved contaminant reduction can generally be considered negligible.

4.4.1.3 Dispersion and Dilution

Hydrodynamic dispersion is the process whereby a contaminant plume spreads out in directions that are longitudinal and transverse to the direction of plume migration. Dispersion of organic solutes in an aquifer is an important consideration when modeling RNA. Dispersion of a contaminant dilutes the concentrations of the contaminant, and introduces the contaminant into portions of the aquifer with different geochemical conditions, where it may be attenuated more or less rapidly than in the main plume area. Hydrodynamic dispersion consists of mechanical dispersion and molecular diffusion. Molecular diffusion is only important where groundwater velocities are very low. At the HWSA, as in most cases, mechanical dispersion dominates.

As defined by Domenico and Schwartz (1990), mechanical dispersion is mixing that occurs as a result of local variations in velocity around some mean velocity of flow. With time, a given volume of solute will gradually become more dispersed as different portions of the mass are transported at the differing velocities. In general, the main cause of variations of both rate and direction of transport velocities is the heterogeneity

of the porous aquifer medium. These heterogeneities are present at scales ranging from microscopic (e.g., pore to pore) to macroscopic (e.g., well to well) to megascopic (e.g., a regional aquifer system). In general, these heterogeneities are a function of the site geology. At the HWSA, the unconsolidated aquifer materials are relatively heterogeneous, as is common with glacial till deposits. Thus, dispersion is likely to be an important factor governing contaminant fate and transport. However, quantifying dispersion is difficult; it is dependent upon the scale (length) of the plume and upon the nature of the heterogeneities that control mechanical dispersion. Dispersion is typically only quantified where needed for transport modeling.

Recharge from infiltrating precipitation is the result of a complex series of processes in the unsaturated zone. Description of these processes is beyond the scope of this discussion; however, it is worth noting that the infiltration of precipitation through the vadose zone brings the water into contact with the soil and thus may allow dissolution of additional electron acceptors and possibly organic soil matter (a potential source of electron donors). Infiltration therefore provides fluxes of water, inorganic species, and possibly organic species into the groundwater. Consequently, the water entering the groundwater system will not only aid in dilution of a contaminant plume but it may also add electron acceptors and possibly electron donors to the groundwater. At the HWSA, dilution from recharge may be minimized by the clayey nature of the shallow soil and future land use plans which call for an impermeable concrete over much of the site.

4.4.1.4 Discussion

The preceding discussion shows that solubility and sorptive characteristics are important chemical characteristics to consider when assessing whether groundwater contaminants may present an unacceptable risk to human health or the environment. Site contaminants characterized by relatively high water solubility and low sorptive properties readily partition from soils or LNAPL and can be transported with groundwater. Less soluble and more sorptive compounds are less likely to leach and do not travel as rapidly. Consequently, more mobile compounds detected at the HWSA, such as VC or benzene, provide an indication of the "leading edge" of the contaminant

plume(s) and should be monitored during routine and confirmatory groundwater sampling.

4.4.2 Destructive Attenuation Mechanisms

In comparison to nondestructive chemical attenuation processes, destructive chemical attenuation processes result in the permanent removal of contaminant mass from the environment thereby reducing the incremental risk contributed by these contaminants. The effectiveness of destructive attenuation processes at reducing contaminant mass at a site depends on how amenable the chemical is to biodegradation and whether the site is characterized by physical, chemical, and biological conditions favorable to such processes. In general, there are two destructive attenuation mechanisms that must be considered when evaluating chemical fate. The most significant of these is biodegradation, although abiotic chemical reactions can affect some solutes.

4.4.2.1 Overview of Biodegradation Processes

Microorganisms obtain energy for cell production and maintenance by facilitating thermodynamically advantageous redox reactions involving the transfer of electrons from electron donors to available electron acceptors. This results in the oxidation of the electron donor and the reduction of the electron acceptor. Electron donors may be natural organic carbon, fuel hydrocarbon compounds, and less-chlorinated solvents (e.g., VC, DCE, or DCA). Fuel hydrocarbons or solvents are completely degraded or detoxified if they are utilized as the primary electron donor (i.e., as a primary substrate or carbon source) for microbial metabolism (Bouwer, 1992). Electron acceptors are elements or compounds that occur in relatively oxidized states, and include oxygen, nitrate, ferric iron, sulfate, manganese, carbon dioxide, and highly chlorinated solvents (e.g., PCE, TCE, TCA, and polychlorinated benzenes).

The driving force of biodegradation is electron transfer, which is quantified by the Gibbs free energy of the reaction (ΔG°_r) (Stumm and Morgan, 1981; Bouwer, 1994; Godsey, 1994). The value of ΔG°_r represents the quantity of free energy consumed ($\Delta G^\circ_r > 0$) or yielded ($\Delta G^\circ_r < 0$) to the system during the reaction. Although

thermodynamically favorable, most of the reactions involved in biodegradation of fuel hydrocarbons or chlorinated solvents cannot proceed abiotically because of the lack of activation energy. Microorganisms are capable of providing the necessary activation energy; however, they will facilitate only those redox reactions that have a net yield of energy (i.e. $\Delta G^\circ_r < 0$). Microorganisms preferentially utilize electron acceptors while metabolizing hydrocarbons (Bouwer, 1992). DO is utilized first as the prime electron acceptor. After the DO is consumed, anaerobic microorganisms typically use electron acceptors in the following order of preference: nitrate, manganese, ferric iron hydroxide, sulfate, and finally carbon dioxide. Chlorinated solvents can also be used as electron acceptors when aquifer conditions are such that sulfate or carbon dioxide are preferred electron acceptors.

Depending on the types and concentrations of electron acceptors present (e.g., nitrate, sulfate, carbon dioxide), as well as pH and redox conditions, anaerobic biodegradation (using the contaminant as a substrate/electron donor) can occur by denitrification, manganese reduction, ferric iron reduction, sulfate reduction, or methanogenesis. Other, less common anaerobic degradation mechanisms such as manganese or nitrate reduction may dominate if the physical and chemical conditions in the subsurface favor use of these electron acceptors. Vroblesky and Chapelle (1994) show that the dominant terminal electron accepting process can vary both temporally and spatially in an aquifer with fuel hydrocarbon contamination. Biodegradation in which the contaminant is used as an electron acceptor is also dependent upon site geochemical conditions and is more likely to occur under reducing conditions.

4.4.2.2 Biodegradation of BTEX

Numerous laboratory and field studies have shown that hydrocarbon-degrading bacteria can participate in the degradation of many of the chemical components of fuel hydrocarbons, including the BTEX compounds (e.g., Jamison *et al.*, 1975; Atlas, 1981, 1984, 1988; Gibson and Subramanian, 1984; Reinhard *et al.*, 1984; Young, 1984; Bartha, 1986; Wilson *et al.*, 1986, 1987, and 1990; Barker *et al.*, 1987; Baedeker *et al.*, 1988; Lee, 1988; Chiang *et al.*, 1989; Grbic-Galic, 1989 and 1990;

Cozzarelli *et al.*, 1990; Leahy and Colewell, 1990; Altenschmidt and Fuchs, 1991; Alvarez and Vogel, 1991; Baedeker and Cozzarelli, 1991; Ball *et al.*, 1991; Bauman, 1991; Borden, 1991; Brown *et al.*, 1991; Edwards *et al.*, 1991 and 1992; Evans *et al.*, 1991a and 1991b; Haag *et al.*, 1991; Hutchins and Wilson, 1991; Hutchins *et al.*, 1991a and 1991b; Beller *et al.*, 1992; Bouwer, 1992; Edwards and Grbic-Galic, 1992; Thierrin *et al.*, 1992; Malone *et al.*, 1993; Davis *et al.*, 1994). Fuel hydrocarbons biodegrade naturally when an indigenous population of hydrocarbon-degrading microorganisms is present in the aquifer and sufficient concentrations of electron acceptors and nutrients are available to these organisms.

During biodegradation of fuel hydrocarbons, the fuel compounds are used as electron donors. They are the primary substrate ("food") for the microbes, while the electron acceptors provide the oxidant used to reduce (metabolize) the substrate and produce energy. In most subsurface environments, both aerobic and anaerobic degradation of fuel hydrocarbons can occur, often simultaneously in different parts of the plume. The reduction of highly oxidized electron acceptors (e.g., oxygen/DO) results in an overall decrease in the oxidizing potential of the groundwater. The reduction of oxygen and nitrate will reduce the oxidizing potential to levels at which ferric iron (Fe^{3+}) reduction can occur. As each chemical species that can be used to oxidize the contaminants is exhausted, the microorganisms are forced to use other available electron acceptors with lower oxidizing capacity. When sufficiently reducing conditions have been developed as a result of these redox reactions, sulfate reduction and methanogenesis can occur almost simultaneously (Stumm and Morgan, 1981).

The ubiquitous nature of these processes in the groundwater environment is well documented (e.g., Rice *et al.*, 1995; Wiedemeier *et al.*, 1995; Kuehne and Buscheck, 1996). Aerobic destruction of BTEX compounds dissolved in groundwater results in the consumption (reduction) of DO and the formation of carbon dioxide. Anaerobic destruction of the BTEX compounds is associated with the accumulation of fatty acids, production of methane, solubilization of iron, and reduction of nitrate and sulfate (Cozzarelli *et al.*, 1990; Wilson *et al.*, 1990).

Groundwater data collected at the HWSA indicate that biodegradation of fuel hydrocarbons (especially BTEX) is an ongoing process. One indication that biodegradation is ongoing is provided by BTEX plume data collected over time (Figure 4.6 and Table 4.11). In general, the data show that although dissolved BTEX concentrations in the source area are stable, the extent of the BTEX plume has not changed significantly, suggesting that biodegradation is limiting migration of BTEX at the site. It is unlikely that this is attributable solely to sorption, because there would still be some movement of the plume, and also because sorption is typically limited by the amount of organic carbon available in the aquifer matrix. A stable plume of this nature implies that some residual soil contamination is likely continuing to introduce a minor amount of BTEX into groundwater, approximately at the same rate that natural attenuation processes are removing mass or decreasing dissolved concentrations.

Moreover, geochemical evidence indicates that biodegradation reactions are taking place at the site. These geochemical changes generally coincide with the BTEX plume at the HWSA, and given the ubiquitous nature of fuel hydrocarbon biodegradation, are almost certainly the result of such degradation. In general, DO is depleted in monitoring wells and points in the vicinity of the BTEX plume (Table 4.13), as is sulfate (Figure 4.9). Also, ferrous iron and methane concentrations are elevated within or just downgradient of the BTEX plume (Figures 4.10 and 4.11). Such patterns are typically observed at sites where dissolved fuel hydrocarbons are being biodegraded, because DO is consumed first, and as conditions become more reducing, ferrous iron is produced (due to use of ferric iron as an electron acceptor), then sulfate is consumed, and finally methane is produced.

Elevated concentrations of ferrous iron (Fe^{2+}) are of note because they often are found in anaerobic portions of fuel-contaminated groundwater systems. Recent evidence suggests that the reduction of ferric iron cannot proceed at all without microbial mediation (Lovley and Phillips, 1988; Lovley *et al.*, 1991; Chapelle, 1993). None of the common organic compounds found in low-temperature, neutral, reducing groundwater could reduce ferric oxyhydroxides to ferrous iron under sterile laboratory

TABLE 4.13
NATURAL ATTENUATION GROUNDWATER GEOCHEMICAL DATA
JUNE/JULY 1997
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Sample Location	Sample Date	FIELD DATA						LABORATORY DATA		
		Dissolved Oxygen (mg/L) ^{a/}	Redox Potential (mV) ^{b/}	Ferrous Iron (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	NH3 (mg/L)	Chloride (mg/L)	Methane (mg/L)	Ethane (mg/L)
ESMP-2D	Jul-97	0.9	-62.2	1.7	0.4	0.003	0.07	10	0.081	ND ^{c/}
ESMP-2S	Jul-97	NT ^{d/}	NT	NT	NT	NT	NT	NT	0.055	ND
ESMP-3D	Jun-97	0.77	-19	0.87	0.4	0.001	0.15	15	0.024	ND
ESMP-4D	Jun-97	0.67	11.4	0.33	0.3	0.001	0.2	10	0.012	ND
ESMP-4S	Jun-97	0.74	38.2	0.66	0.3	0.002	0.23	15	0.791	ND
ESMP-6D	Jun-97	1.34	NT	0.148	0.4	0.003	0.25	10	0.016	ND
ESMP-8S	Jun-97	5.43	189.1	NT	NT	NT	NT	NT	ND	ND
ESMP-10S	Jun-97	0.69	212.8	0.72	0.1	0.006	0.28	10	0.002	ND
ESMP-12S	Jun-97	2.77	186.7	NT	NT	NT	NT	NT	0.004	ND
ESMP-13S	Jun-97	1	-120.3	2.94	0	0	0.94	15	22.6	0.096
ESMP-14D	Jun-97	1.29	10.3	2.17	0.3	0.002	0.32	10	0.279	0.001
ESMP-15S	Jun-97	0.84	-128.5	3.02D ^{e/}	0	0	0.21	15	0.16	ND
ESMP-16D	Jun-97	0.65	-96.1	2.9D	0	0	0.48	15	0.15	ND
ESMP-16S	Jun-97	0.84	-115.5	14.5D	0	0	2.72	15	4.85	ND
ESMP-17S	Jun-97	2.42	-323	13.5D	0	0	0.51	10	0.604	0.011
MW-2	Jun-97	1.58	-30.5	0.2	0.005	0.5	0.23	10	0.248	ND
MW-3	Jul-97	5.95	198.5	0.14	0.6	0.006	0.08	10	ND	ND
MW-4	Jun-97	1.32	236	0	0.3	0.005	0.05	5	ND	ND
MW-5	Jul-97	NT	NT	4.34D	0	0	0.7	10	4.62	ND
MW-6	Jun-97	3.76	225	0	0.6	0.002	0.22	10	ND	ND
MW-8	Jun-97	1.36	178.3	0.13	0	0	0.23	10	ND	ND
MW-9	Jun-97	0.59	-4.8	0.32	0.2	0.001	0.93	15	0.004	ND
MW-10	Jun-97	0.66	-59.4	1.36	0.1	0	0.36	15	0.112	ND
MW-11	Jun-97	0.66	195.5	0	0.3	0.004	0.03	10	0.005	ND
MW-12	Jun-97	1.36	218.1	0	0.3	0.002	1.5	15	0.001	ND
MW-101D	Jul-97	0.74	-56.8	1.95	0.3	0	0.8	15	0.37	ND
MW-101S	Jul-97	1.06	-111.8	4.16D	0	0	0.35	10	0.635	ND
MW-102D	Jul-97	0.75	-77.7	3.1	0.3	0	0.25	15	0.217	ND
MW-102S	Jul-97	1.02	-74.2	5.1	0.2	0	0.2	10	1.16	ND
MW-103D	Jul-97	0.76	9.9	2.22	0.4	0.002	0.5	20	0.089	ND
MW-103S	Jul-97	0.87	-11.9	1.61	0.4	0.002	0.13	10	0.01	ND
MW-104D	Jul-97	0.75	-36.4	1.52	0.3	0.002	0.06	15	0.112	ND
MW-105D	Jul-97	0.87	-51.9	2.57	0.3	0.001	0.16	10	0.045	ND
MW-105S	Jul-97	0.79	-61.8	2.35	0.3	0	0.12	15	0.239	ND
MW-106D	Jul-97	0.81	-24.4	1.19	0.3	0.001	0.15	15	0.066	0.002

Note: A more complete listing of geochemical data for December 1996, March 1997, and June/July 1997 are presented in Appendix C.

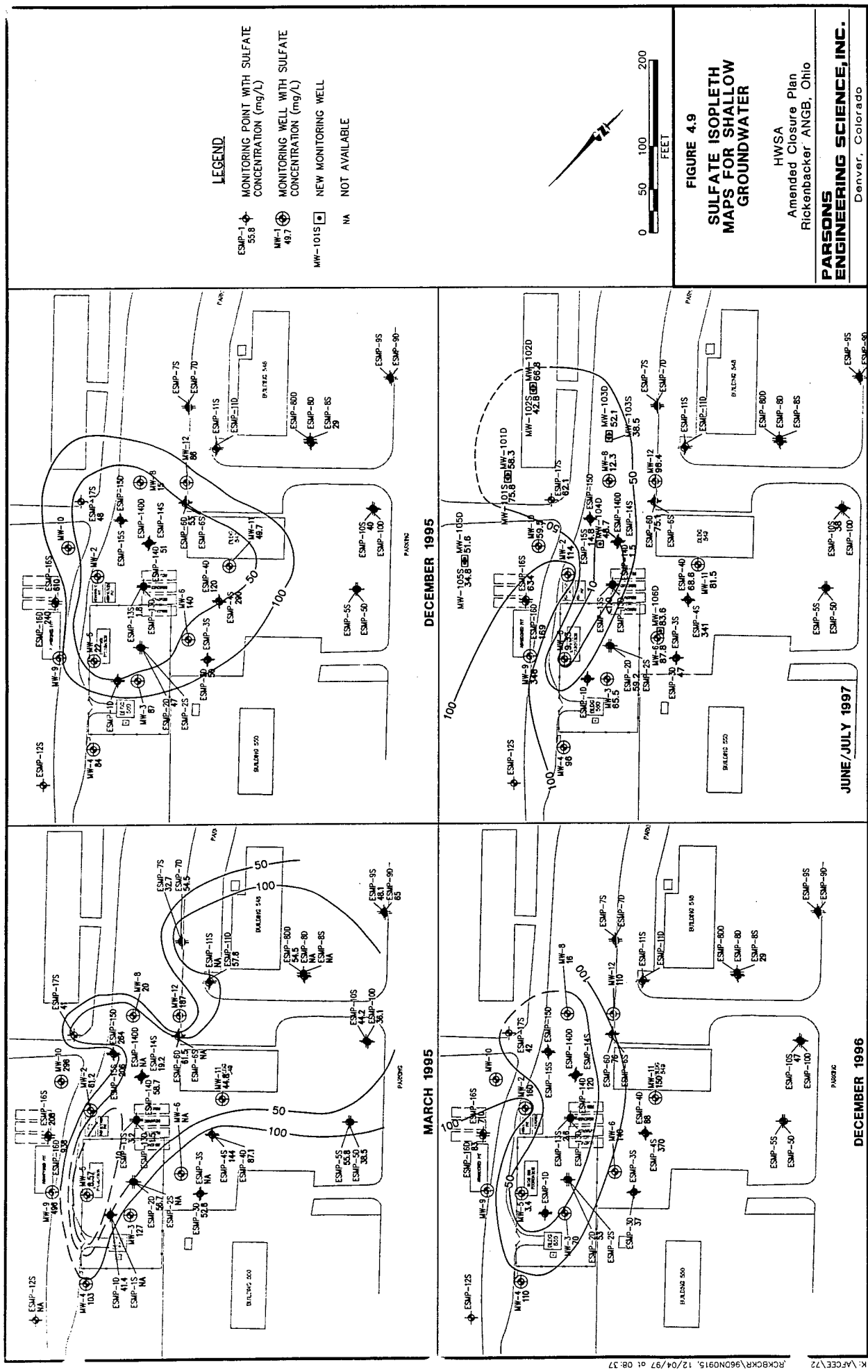
a/ mg/L = milligrams per liter.

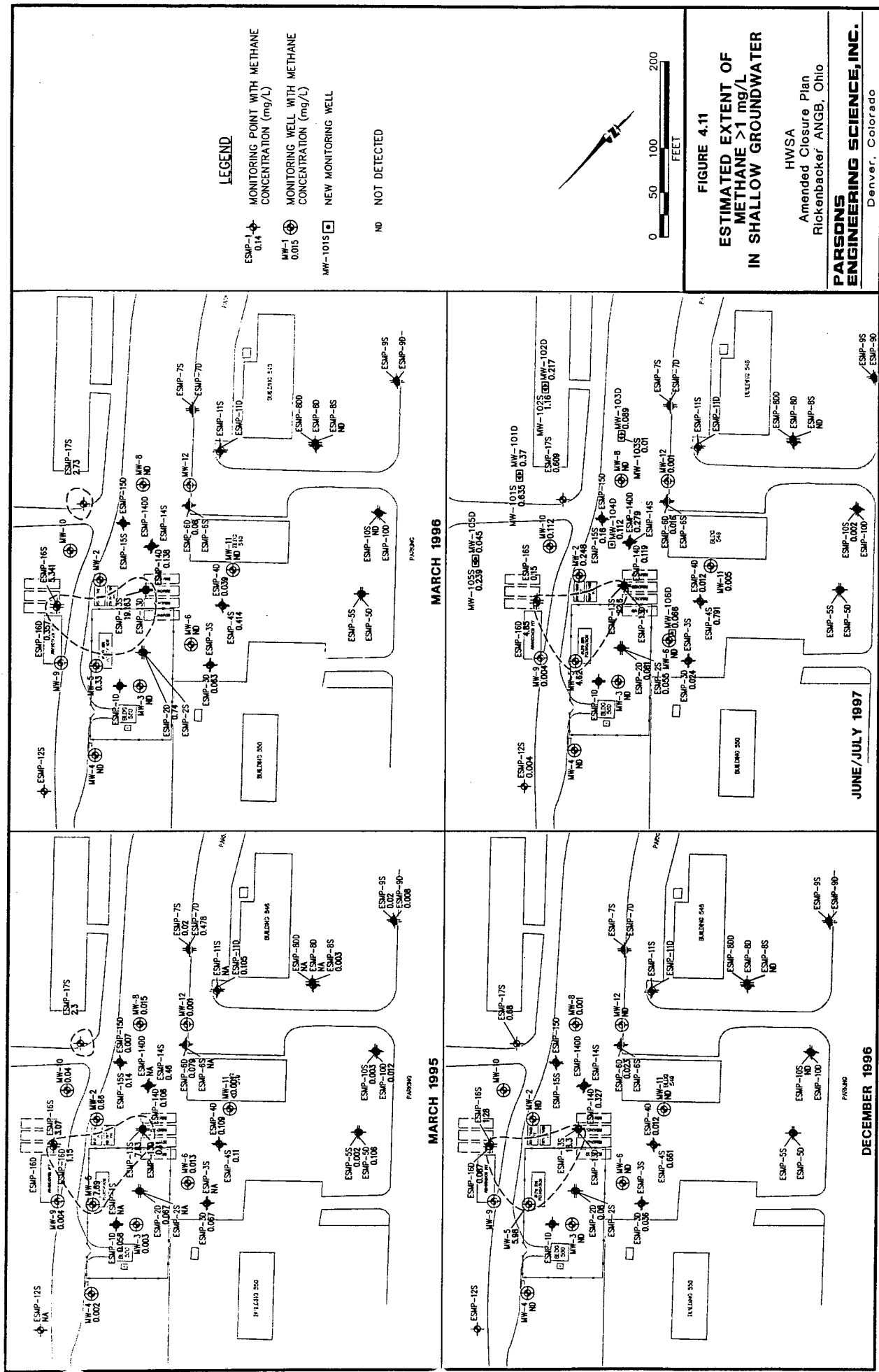
b/ mV = millivolts.

c/ ND = not detected.

d/ NT = sample not tested for this parameter.

e/ D = compound analyzed at a secondary dilution factor.





conditions (Lovley *et al.*, 1991). This means that the reduction of ferric iron requires mediation by microorganisms with the appropriate enzymatic capabilities, and those microbes likely use fuel hydrocarbons as a substrate/electron donor. This is further evidence of biodegradation of fuel hydrocarbons in HWSA groundwater.

4.4.2.3 Biodegradation of Chlorinated Solvents

Chlorinated solvents can be transformed, directly or indirectly, by biological processes (e.g., Bouwer *et al.*, 1981; Miller and Guengerich, 1982; Wilson and Wilson, 1985; Nelson *et al.*, 1986; Bouwer and Wright, 1988; Little *et al.*, 1988; Mayer *et al.*, 1988; Arciero *et al.*, 1989; Cline and Delfino, 1989; Freedman and Gossett, 1989; Folsom *et al.*, 1990; Harker and Kim, 1990; Alvarez-Cohen and McCarty, 1991a, 1991b; DeStefano *et al.*, 1991; Henry, 1991; McCarty *et al.*, 1992; Hartmans and de Bont, 1992; McCarty and Semprini, 1994; Vogel, 1994; Bradley and Chapelle, 1996; Klier *et al.*, 1996). Biodegradation of chlorinated solvents results from the same general processes that bring about biodegradation of fuel hydrocarbons. However, a more complex series of processes often is involved, and chlorinated solvents may act as both a substrate (electron donor) and an electron acceptor. Chlorinated solvents may undergo biodegradation through three different pathways: use as an electron acceptor, use as an electron donor, or cometabolism, which is degradation resulting from exposure to a catalytic enzyme fortuitously produced during an unrelated process. At a given site, one or all of these processes may be operating, although at many sites the use of chlorinated solvents as electron acceptors appears to be most likely.

Under anaerobic conditions, biodegradation of chlorinated solvents usually proceeds through a process called reductive dehalogenation. During this process, the halogenated hydrocarbon is used as an electron acceptor, not as a source of carbon, and a halogen atom is removed and replaced with a hydrogen atom. In general, reductive dehalogenation of chlorinated ethenes occurs by sequential dechlorination from PCE to TCE to DCE to VC to ethene. Depending upon environmental conditions, this sequence may be interrupted, with other processes then acting upon the products.

During reductive dehalogenation, all three isomers of DCE can theoretically be produced; however, Bouwer (1994) reports that under the influence of biodegradation, *cis*-1,2-DCE is a more common intermediate than *trans*-1,2-DCE, and that 1,1-DCE is the least prevalent intermediate of the three DCE isomers. Reductive dehalogenation of chlorinated solvent compounds is associated with the accumulation of daughter products (e.g., *cis*-1,2-DCE, VC) and an increase in chloride concentrations (which may not be distinguishable, depending upon background concentrations).

Reductive dehalogenation affects each of the chlorinated ethenes differently. Of these compounds, PCE is the most susceptible to reductive dehalogenation because it is the most oxidized. Conversely, VC is the least susceptible to reductive dehalogenation because it is the least oxidized of these compounds. The rate of reductive dehalogenation also has been observed to decrease as the degree of chlorination decreases (Vogel and McCarty, 1985; Bouwer, 1994). Murray and Richardson (1993) have postulated that this rate decrease may explain the accumulation of VC in PCE and TCE plumes that are undergoing reductive dehalogenation. In addition to being affected by the degree of chlorination of the compound, reductive dehalogenation can also be controlled by the redox conditions of the site groundwater system. In general, reductive dehalogenation has been demonstrated under anaerobic nitrate- and sulfate-reducing conditions, but the most rapid biodegradation rates, affecting the widest range of chlorinated solvents, occur under methanogenic conditions (Bouwer, 1994). Dehalogenation of PCE and TCE to DCE can proceed under mildly reducing conditions such as nitrate reduction or iron (III) reduction (Vogel *et al.*, 1987), while the transformation of DCE to VC, or the transformation from VC to ethene requires more strongly reducing conditions (Freedman and Gossett, 1989; DeStefano *et al.*, 1991; De Bruin *et al.*, 1992).

Where chlorinated compounds are used as electron acceptors, there must be an appropriate source of carbon for microbial growth in order for reductive dehalogenation to occur (Bouwer, 1994). Potential carbon sources can include fuel hydrocarbons, low-

molecular-weight compounds (e.g., lactate, acetate, methanol, or glucose) present in natural organic matter, or less-chlorinated solvents (as discussed below).

Under aerobic conditions some chlorinated compounds can be utilized as the primary substrate (i.e., electron donor) in biologically mediated redox reactions (McCarty and Semprini, 1994). In this type of reaction, the facilitating microorganism obtains energy and organic carbon from the degraded solvent. In contrast to reactions in which the chlorinated solvent is used as an electron acceptor, only the least oxidized solvents (e.g., VC, DCE, or chlorobenzene) may be utilized as electron donors in biologically mediated redox reactions. For example, while Murray and Richardson (1993) write that microorganisms are generally believed to be incapable of growth using TCE and PCE, other less chlorinated compounds have been shown to be used as substrates. Davis and Carpenter (1990) describe the aerobic oxidation of VC in groundwater. McCarty and Semprini (1994) describe investigations in which VC and 1,2-DCA were shown to serve as primary substrates. Klier *et al.* (1996) describe aerobic mineralization of all three isomers of DCE. In addition, Bradley and Chapelle (1996) show evidence of oxidation of VC under iron-reducing conditions so long as there is sufficient bioavailable iron (III).

When a chlorinated solvent is biodegraded through cometabolism, it serves as neither an electron acceptor nor a primary substrate in a biologically mediated redox reaction. Instead, the degradation of the solvent is catalyzed by an enzyme or cofactor that is fortuitously produced by organisms for other purposes. The organism receives no known benefit from the degradation of the solvent; rather the cometabolic degradation of the solvent may in fact be harmful to the microorganism responsible for the production of the enzyme or cofactor (McCarty and Semprini, 1994). Cometabolism is best documented in aerobic environments, although it potentially could occur under anaerobic conditions. It has been reported that under aerobic conditions chlorinated ethenes, with the exception of PCE, are susceptible to cometabolic degradation (Murray and Richardson, 1993; Vogel, 1994; McCarty and Semprini, 1994). In the cometabolic process, TCE is indirectly transformed by bacteria as they

use BTEX or another substrate to meet their energy requirements. Therefore, TCE does not enhance the degradation of BTEX or other carbon sources, nor will its cometabolism interfere with the use of electron acceptors involved in the oxidation of those carbon sources. Given this relationship, it would follow that depletion of suitable substrates (BTEX or other organic carbon sources) likely limits cometabolism of chlorinated solvents.

Available site data for the HWSA show that conditions are favorable for reductive dehalogenation of chlorinated solvents. As noted in the discussion of BTEX biodegradation, reducing conditions have been created via consumption of fuel hydrocarbons. The reduced sulfate concentrations (Figure 4.9) and the presence of methane (Figure 4.11) indicate optimal conditions for reductive dehalogenation. Evidence of reductive dehalogenation is provided by the presence of *cis*-1,2-DCE and VC in concentrations greater than the observed TCE concentrations (Table 4.10), especially in the vicinity of ESMP-17S. While TCE and PCE are commonly used as solvents, the presence of *cis*-1,2-DCE and VC demonstrates that chlorinated degradation is occurring in site groundwater because the only potential source of these compounds is as a byproducts of reductive dehalogenation. In addition, ethene has been detected in monitoring points ESMP-13S and ESMP-17S, indicating that some of the VC is also being dehalogenated (Table 4.13). Because the microbial dehalogenation of VC is the slowest of such reactions, VC concentrations actually increase downgradient from the source area where TCE and DCE concentrations are greatest. However, it also should be noted, that VC will be consumed as a substrate/electron donor as it migrates into more oxidizing groundwater which surrounds the HWSA.

Determining if solvents such as VC, DCE, or DCA are being used as electron donors is difficult, generally because the reactions generally produce only carbon dioxide and water, or other intermediates that are rapidly biodegraded. However, based on chlorinated VOC contaminant data presented in Table 4.10 and Figure 4.7, it appears that the CAH plume is relatively stable as a result of the reductive dechlorination of TCE and DCE and biological oxidation of VC in downgradient

groundwater. If RNA is to be relied upon as the primary remediation/risk-reduction strategy for the site, additional monitoring will be necessary to validate this assumption.

Cometabolism of solvents is also difficult to detect, and the most well-understood pathways involve aerobic metabolism of organic compounds such as butane, methane, propane, toluene, ethene, or VC. Cometabolism is a potential mechanism for biodegradation of chlorinated solvents in groundwater downgradient of the source area.

With BTEX compounds the occurrence of complete biodegradation to less toxic compounds is ubiquitous, and the HWSA data show these effects with a stable BTEX plume, but for chlorinated compounds, biodegradation produces toxic intermediates (e.g., VC), and at the HWSA, the downgradient extent of this plume, is not as yet completely defined (relatively low levels of DCE and VC have been detected in newly installed monitoring well MW-101S). In order to determine the applicability and effectiveness of destructive attenuation processes in reducing the contaminant mass of chlorinated compounds (particularly VC), additional monitoring data are needed. For RNA to be considered as an effective risk-reduction strategy for the site, additional data would need to be collected in downgradient areas to verify plume stability. A steady or retreating plume observed over several years is the most unequivocal evidence of the effectiveness of natural attenuation processes.

4.4.2.4 Abiotic Degradation

Chlorinated solvents dissolved in groundwater may also be degraded by abiotic mechanisms, although the reactions may not be complete and often result in the formation of a toxic intermediate. The most common abiotic reactions affecting chlorinated solvents are hydrolysis and dehydrohalogenation. Hydrolysis is a substitution reaction in which a halogen substituent is replaced with a hydroxyl (OH) group from a water molecule. Dehydrohalogenation is an elimination reaction in which a halogen is removed from a carbon atom, followed by removal of a hydrogen atom from an adjacent carbon atom, with a double bond between the carbon atoms being produced. Other possible reactions include oxidation and reduction, although Butler

and Barker (1996) note that no abiotic oxidation reactions involving common halogenated solvents have been reported in the literature, and that reduction reactions are most commonly microbially mediated. Butler and Barker (1996) also note that attributing changes in the presence, absence, or concentration of halogenated solvents to abiotic processes is usually difficult, particularly on the field scale. Solvents may undergo both biotic and abiotic degradation, and discerning the effects of each mechanism (on the field scale), if possible, would be very difficult. Also, as Butler and Barker (1996) note, the breakdown products of some reactions such as hydrolysis (e.g., acids and alcohols) may be more easily degraded (biotically or abiotically); these products also require additional analyses that may not be feasible for a field investigation. This makes collection of field evidence to demonstrate hydrolysis very difficult to collect and interpret. Further, evidence of abiotic degradation of the particular solvents detected at the HWSA (e.g., TCE, DCE, VC, and DCA) is limited and suggests that if it occurs, it occurs at extremely slow rates.

4.4.3 Discussion and Conclusions

The purpose of this subsection was to describe the likely processes affecting contaminant fate and to describe how the available data indicate which destructive and nondestructive attenuation processes are significant in groundwater in the vicinity of the HWSA. The fate of contaminants in groundwater at the site is affected by several factors. In general, available data show that concentrations of these contaminants are being attenuated by natural nondestructive and destructive processes. However, while evidence of these processes is apparent, the long-term effects cannot be predicted without additional long-term monitoring. The important points of this subsection are summarized as follow:

- Nondestructive attenuation mechanisms may be partially responsible for observed contaminant attenuation. Of these processes, dispersion is likely to be the most important, and sorption also will be important for most organic and inorganic compounds. However, VC is not likely to be affected by sorption due to its chemical characteristics.

- Geochemical evidence indicates that BTEX compounds are biodegrading in saturated soils and groundwater at the HWSA via aerobic respiration, ferric iron reduction, sulfate reduction, and methanogenesis. Further evidence of the effectiveness of biodegradation and nondestructive attenuation processes affecting fuel hydrocarbons is provided by data showing that the BTEX plume is stable (i.e., not expanding) and that BTEX concentrations are fluctuating without a clear trend towards increasing or decreasing.
- Reductive dehalogenation of chlorinated hydrocarbons is occurring, fostered by the reducing conditions produced through biodegradation of fuel compounds. It appears that TCE is being degraded to DCE (primarily *cis*-1,2-DCE) and VC, and that some VC is converted to ethene. However, this process may not completely remove all of the solvent mass, particularly because the step from VC to ethene is slow.
- If the VC plume moves outside of the area with the most reducing conditions, as illustrated by Figures 4.9 through 4.11, it can be oxidized. To observe whether this process or any of the nondestructive processes is an effective means for reducing VC contaminant mass in site groundwater, additional monitoring will be required.
- Apparently elevated concentrations of several inorganic compounds may in part be attributable to the localized changes in reduction-oxidation conditions brought about by the microbially mediated reactions involving organic contamination. Once sufficient organic mass has been biodegraded, groundwater redox conditions will be restored to pre-release (more oxidizing) characteristics. Consequently, the attenuation of inorganic compounds appears to be tied to the short- and long-term fate of the hydrocarbon compounds that are driving changes in groundwater geochemical conditions.
- The BTEX compounds are unlikely to migrate beyond the boundaries of the observed plume; however, once a sufficient amount of petroleum compounds are

removed from the system, reductive dehalogenation will cease and the remaining chlorinated compounds will only be affected by oxidative processes. Additional groundwater monitoring is the key to ultimately understanding the effect of destructive and non-destructive attenuation processes upon dissolved contaminants.

To evaluate whether current levels of site contamination pose an unacceptable risk to human health, Section 5 documents the potential risks to human receptors based on the observed site concentrations and the types of exposures that could occur at the HWSA under current and foreseeable future conditions. This initial review suggests that dissolved petroleum hydrocarbons and chlorinated compounds are unlikely to migrate off-Base in concentrations posing unacceptable risk, based on current and future land use scenarios. However, complete delineation of the chlorinated plume is recommended, as is continued groundwater monitoring at the site.

SECTION 5

RISK ASSESSMENT

A comprehensive risk assessment was performed to quantitatively evaluate potential risk to human and ecological receptors based on site-specific conditions and assumptions regarding exposure to chemicals of potential concern (COPCs) at the former HWSA, Building 560, Rickenbacker ANGB. All COPCs were evaluated using standard USEPA (1989, 1991a-c, and 1992a-e) and Ohio EPA (1993a and 1993b) risk assessment practices. Individual risks or hazards were then combined to determine the overall carcinogenic risks and noncancer hazards for all complete exposure pathways at the site.

The results of this risk assessment show that existing concentrations of organic and inorganic chemicals found at the HWSA do not pose an unacceptable level of carcinogenic risk to current or future receptors. The assessment also demonstrates that exposure to noncancer hazards is at or below the threshold level that could potentially trigger remedial action. Based on the conceptual site model (CSM), which considers current and future (industrial) land use scenarios, affected media, release mechanisms, and potential exposure routes, a nonintrusive worker performing grounds maintenance activities (a groundskeeper) and a general (hypothetical) onsite worker represent the two current human receptors considered in this risk assessment. The developed nature of the site precludes exposure of ecological receptors. Construction workers performing intrusive activities at the site represent the most likely future receptors. The most significant exposure route of concern is dermal contact with groundwater by construction workers; 90 percent of the cancer risk and 98 percent of the noncancer hazard are associated with dermal exposure to groundwater. Typically, groundwater at the site is present between 8 and 12 feet bgs, which is well below any foreseeable

intrusive site activities such as utility burial. This notwithstanding, groundwater contact is conservatively included in the principal future receptor scenario (a construction worker installing a taxiway). Considering this scenario, the total receptor cancer risk will not exceed 2.99×10^{-6} and the total receptor hazard index (HI) for noncancer risks will not exceed 1. This exposure scenario, and all other scenarios presented in this section consider additive effects for the COPCs and cumulative receptor-specific effects across all exposure routes. Based on the results of this risk assessment, risk-based health standards, or SSTLs, were developed for the COPCs that could potentially pose a risk to current and future receptors.

5.1 IDENTIFICATION OF COPCS IN SOIL AND GROUNDWATER

In order to identify COPCs in soil and groundwater, the most recent sample data characterizing soil and groundwater contaminant levels were used. However, based on the limited collection of soil data during the 1997 additional assessment activities (Section 4); all available historical soil data, as discussed in Sections 3 and 4 and presented in Appendix B, were combined with the 1997 soil data for the purpose of COPC identification. Groundwater contaminant data collected during the June/July 1997 comprehensive groundwater sampling event (Section 4.2.2) were used for the identification of the current COPCs in groundwater. Groundwater analytical data from the June/July 1997 sampling event are provided in Appendix C. All statistical analysis of these data are presented in Appendix E. These analyses include identification of data distributions (normal, lognormal, or nonparametric) and the development of 95-percent UCLs on the means for contaminants in soil and groundwater.

For comparative purposes, background data for all inorganics were obtained. Background concentrations for inorganic compounds in both soil and groundwater were collected and statistically analyzed for Rickenbacker ANGB during previous IRP efforts. Background locations were selected and approved by the Base Closure Team (BCT) consisting of the Air Force, USEPA, and Ohio EPA (IT, 1997d). Background data for soil and groundwater are presented in Appendix E.

USEPA (1992a) has provided recommendations and guidance on appropriate estimated exposure concentrations for use in risk estimates. Because of the uncertainty associated with estimating a true average concentration at a site, the 95-percent UCL on the mean typically is used. This is referred to as the reasonable maximum exposure (RME) concentration term. If data for a site are limited (e.g., less than five samples), it may be necessary to use the maximum value as the concentration term in risk calculations. In general, the data sets for soil and groundwater taken from the HWSA were sufficient in number to compute the 95-percent UCL for use as the concentration term, as prescribed by USEPA (1992a) and Ohio EPA (1993b). USEPA finds that the 95-percent UCL provides reasonable confidence that the true site average will not be underestimated, and increases the consistency and comparability of risk assessments. In those instances where determination of a 95-percent UCL was complicated by consideration of substantial historical data (soils) or where the 95-percent UCL could not be specifically quantified for a data set considering its distribution, the maximum measured site concentration of the analyte was used.

5.1.1 Identification of COPCs in Soil

The first step in developing a final list of soil COPCs was to compare maximum concentrations of all detected inorganics to the 95-percent UCL on the mean background concentration for each respective analyte (Appendix E). Maximum soil concentration values (Appendix E) were determined based on 1997 and all previous soil sampling data collected from the unsaturated soil zone within the boundaries of the HWSA (Figure 2.2). Soil sample results from below the water table (i.e., greater than 10 feet bgs) were not included in this analysis. As presented in Table 5.1, all of the detected site inorganics, with the exception of manganese, remain as COPCs following this initial background screening step.

The second step used to identify soil COPCs was to compare maximum concentrations of all remaining inorganics and all detected organics to conservative, nonsite-specific, health-based, PRGs. As with the initial step, maximum soil values were used because of the difficulty with developing 95-percent UCLs for the large

TABLE 5.1
COMPARISON OF MAXIMUM SITE SOIL CONCENTRATIONS
TO BACKGROUND CONCENTRATIONS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	Maximum Detected Site Concentration ^{a/} (mg/kg) ^{b/}	95-Percent UCL Background Concentration ^{c/} (mg/kg)	Maximum Site Concentration Exceeds Background
Inorganics			
Aluminum	18,000	15,095	Yes
Antimony	6	ND ^{d/}	Yes
Arsenic	42	15.9	Yes
Barium	190	149	Yes
Beryllium	1.2	0.89	Yes
Cadmium	9.1	0.77	Yes
Chromium	25.6	18.8	Yes
Cobalt	17	14.8	Yes
Copper	73.1	29.3	Yes
Lead	382	22.5	Yes
Manganese	640	746.0	No
Mercury	2.6	ND	Yes
Nickel	60	44.1	Yes
Selenium	1.9	ND	Yes
Silver	7.2	1.2	Yes
Thallium	10.5	ND	Yes
Vanadium	38	36.1	Yes
Zinc	522	92.1	Yes

^{a/} Maximum detected site concentration based on all available historic data (Appendix B) and data collected during 1997 (Appendix C) for the hazardous waste storage area.

^{b/} mg/kg = milligrams per kilogram.

^{c/} Source: (IT, 1997d). Background concentrations represent the 95-percent upper confidence limit (UCL) on the mean for surface soil samples (samples collected from 0 to 2 feet below ground surface) collected at Rickenbacker ANGB in areas outside the zone of influence of the HWSA and other environmental sites.

^{d/} ND = This analyte was not detected in any of the Rickenbacker ANGB background soil samples (IT, 1997d).

quantity of soil data collected prior to 1997. The PRGs were developed using the algorithms and the associated parameters defined by Ohio EPA (1993b) for industrial land-use scenarios (Section 2.3). These PRGs account for the cumulative effects of three primary routes of exposure (i.e., inhalation, ingestion, and dermal contact) and the additivity of multiple carcinogens and noncarcinogens. In accordance with recent Ohio EPA (1997) policy decisions, a cumulative target risk level of 1 in 100,000 (10^{-5}) was used for the multi-pathway, multi-chemical PRGs. Use of these PRGs does not imply that these exposure assumptions are representative of site conditions; rather this conservative approach was used to identify those chemicals which have the potential to contribute to cumulative site risks. The comparison of maximum detected site soil concentrations to the PRGs is presented in Table 5.2. Calculations and reference citations used for the development of these PRGs are presented in Appendix F.

Based on this second-level comparison, two inorganics (arsenic and beryllium), six SVOCs [benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene], and one VOC (benzene) were retained for further COPC screening. The final step in the identification of COPCs in soil was to determine the 95-percent UCL on the mean for the remaining soil COPCs (Appendix E) and compare these values to the conservative, health-protective PRGs presented in Table 5.2. The results of this comparison are presented in Table 5.3. Based on this comparison, the following compounds are identified as soil COPCs warranting further evaluation in the risk assessment:

- Arsenic;
- Beryllium;
- Benzo(a)pyrene;
- Benzo(a)anthracene;
- Benzo(b)fluoranthene;

TABLE 5.2
COMPARISON OF MAXIMUM SITE SOIL CONCENTRATIONS
TO SCREENING CRITERIA
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	Maximum Detected Site Concentration ^{a/} (mg/kg) ^{b/}	PRG - Industrial Land Use ^{c/} (mg/kg)	Maximum Site Concentration Exceeds PRG ^{d/}
Inorganics			
Aluminum	18,000	NA ^{e/}	No
Antimony	6	9.71	No
Arsenic	42	0.422	Yes
Barium	190	8,120	No
Beryllium	1.2	0.00694	Yes
Cadmium	9.1	204	No
Chromium	25.6	237	No
Cobalt	17	NA	No
Copper	73.1	36,800	No
Lead	382	400 ^{f/}	No
Mercury	2.6	7.29	No
Nickel	60	1,890	No
Selenium	1.9	5,810	No
Silver	7.2	2,040	No
Thallium	10.5	98.1	No
Vanadium	38	170	No
Zinc	522	147,000	No
Semivolatile Organics			
Acenaphthene	0.002	4,750	No
Anthracene	0.58	23,700	No
Benzo(a)pyrene	2.6	0.00543	Yes
Benzo(a)anthracene	2.1	0.133	Yes
Benzo(b)fluoranthene	3.2	0.133	Yes
Benzo(g,h,i)perylene	1.7	NA	No
Benzo(k)fluoranthene	2.8	1.33	Yes
Bis(2-ethylhexyl)phthalate	4.1	10.2	No
Bis(2-Chloroethyl)ether	0.008	0.203	No
2-Chlorophenol	0.008	584	No
Chrysene	2.8	15.8	No
Dibenz(a,h)anthracene	0.36	0.0133	Yes
Di-n-Butylphthalate	6.5	20,300	No
Fluoranthene	4.1	3,160	No
Fluorene	1.4	4,670	No
Indeno(1,2,3-cd)pyrene	1.7	0.133	Yes
2-Methylnaphthalene	23	NA	No
Naphthalene	5.4	3,160	No
3-Nitroaniline	0.024	237	No
4-Nitroaniline	0.03	237	No
Phenanthrene	5.6	NA	No
Pyrene	5.6	2,370	No

TABLE 5.2 (Continued)
COMPARISON OF MAXIMUM SITE SOIL CONCENTRATIONS
TO SCREENING CRITERIA
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	Maximum Detected Site Concentration ^{a/} (mg/kg) ^{b/}	PRG - Industrial Land Use ^{c/} (mg/kg)	Maximum Site Concentration Exceeds PRG ^{d/}
Volatile Organics			
Acetone	7.6	18,200	No
Benzene	15	0.642	Yes
n-Butylbenzene	0.64	NA	No
sec-Butylbenzene	0.75	NA	No
1,2-Dichloroethane	0.0027	0.273	No
cis-1,2-Dichloroethene	5.8	1,820	No
trans-1,2,-Dichloroethene	0.57	3,630	No
Ethylbenzene	170	5,060	No
Isopropylbenzene	9.2	3,160	No
Methylene Chloride	2.7	8.07	No
Methyl Ethyl Ketone	63	18,700	No
4-Methyl-2-Pentanone	0.009	14,500	No
n-Propylbenzene	1.7	NA	No
Styrene	0.036	13,700	No
1,1,2,2-Tetrachloroethane	0.0063	0.325	No
Toluene	2	2,440	No
1,1,1-Trichloroethane	0.086	NA	No
1,2,3-Trichlorobenzene	0.46	NA	No
Trichloroethene	2.6	2.74	No
1,2,4-Trimethylbenzene	4.3	NA	No
1,3,5-Trimethylbenzene	2	NA	No
Vinyl Chloride	0.0013	0.0189	No
m/p-Xylene	15	405,000	No
o-Xylene	1,900	405,000	No

Note: Supporting calculations for this table are provided in Appendix F.

^{a/} Maximum detected site concentration based on all available historic data (Appendix B) and data collected during 1997 (Appendix C) for the hazardous waste storage area.

^{b/} mg/kg = milligrams per kilogram.

^{c/} Industrial Preliminary Remediation Goal (PRG) calculated based on dose equation and standard default parameters from Ohio EPA (1993b). The value shown represents the most conservative PRG when considering the carcinogenic and noncarcinogenic calculated values.

^{d/} "Yes" is shown if the maximum detected site concentration exceeds the preliminary remediation goal shown.

^{e/} NA = not applicable.

^{f/} A screening level of 400 mg/kg has been set for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (USEPA, 1994).

TABLE 5.3
COMPARISON OF 95-PERCENT UCL SITE SOIL CONCENTRATIONS
TO SCREENING CRITERIA
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	95-Percent UCL Detected Site Concentration ^{a/} (mg/kg) ^{b/}	PRG - Industrial Land Use ^{c/} (mg/kg)	95-Percent UCL Concentration Exceeds PRG ^{d/}
Inorganics			
Arsenic	15.35	0.422	Yes
Beryllium	0.617	0.00694	Yes
Organics			
Benzo(a)pyrene	0.165	0.00543	Yes
Benzo(a)anthracene	0.165	0.133	Yes
Benzene	0.0025	0.642	No
Benzo(b)fluoranthene	0.175	0.133	Yes
Benzo(k)fluoranthene	0.165	1.33	No
Dibenz(a,h)anthracene	0.165	0.0133	Yes
Indeno(1,2,3-cd)pyrene	0.165	0.133	Yes

^{a/} UCL: 95 % upper confidence limit on the mean (see Appendix E).

^{b/} mg/kg = milligrams per kilogram.

^{c/} Industrial Preliminary Remediation Goal (PRG) calculated based on dose equation and standard default parameters from Ohio EPA (1993b). The value shown represents the most conservative PRG when considering the carcinogenic and noncarcinogenic calculated values. Calculations provided in Appendix F.

^{d/} "Yes" is shown if the 95 % UCL site concentration exceeds the preliminary remediation goal shown.

- Dibenz(a,h)anthracene; and,
- Indeno(1,2,3-cd)pyrene.

5.1.2 Identification of COPCs in Groundwater

Similar to the procedure used for soils, COPCs in groundwater warranting further evaluation were identified by comparing groundwater contaminant data first to background concentrations (inorganics only), and then to generic industrial land-use PRGs. Groundwater contaminant data collected from the HWSA during the June/July 1997 comprehensive sampling event was used for the comparison process. For inorganics, total and dissolved concentrations were considered. Table 5.4 presents the comparison of maximum detected groundwater concentrations to the 95-percent UCL background concentrations (Appendix E). Based on this initial comparison, several inorganics were either below background or considered essential human nutrients (calcium, magnesium, potassium, and sodium), and therefore were eliminated from further analysis. The highest value for each remaining inorganic (total or dissolved) was retained for further analysis.

Following comparison to background, the 95-percent UCL concentrations for all remaining inorganics and all detected organics were compared to industrial-land use PRGs for groundwater developed based on Ohio EPA (1993b) guidance (see Section 5.1). Calculations used for the development of groundwater PRGs are presented in Appendix F. Based on this comparison, presented in Table 5.5, the following compounds detected in site groundwater were identified as COPCs warranting further evaluation in the risk assessment:

- Antimony;
- Arsenic;
- Cadmium;

TABLE 5.4
COMPARISON OF MAXIMUM SITE GROUNDWATER CONCENTRATIONS
TO BACKGROUND CONCENTRATIONS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	Maximum Detected Site Concentration ^{a/} (mg/L) ^{b/}	Background ^{c/} Concentration (mg/L)	Maximum Site Concentration Exceeds Background	Retained for Comparison to PRGs
Aluminum ^{d/}	2.2	5.5	No	
Aluminum-D ^{e/}	0.11	5.5	No	
Antimony	ND ^{f/}	ND	No	
Antimony-D	0.057	ND	Yes	Yes
Arsenic	0.013	0.0055	Yes	No ^{g/}
Arsenic-D	0.019	0.0055	Yes	Yes
Barium	0.36	0.097	Yes	Yes
Barium-D	0.36	0.097	Yes	No ^{g/}
Beryllium	ND	ND	No	
Beryllium-D	ND	ND	No	
Cadmium	0.034	ND	Yes	Yes
Cadmium-D	0.026	ND	Yes	No ^{g/}
Calcium	210	170	Yes	No ^{h/}
Calcium-D	210	170	Yes	No ^{h/}
Chromium	ND	ND	No	
Chromium-D	ND	ND	No	
Cobalt	ND	ND	No	
Cobalt-D	ND	ND	No	
Copper	0.0096	ND	Yes	No ^{g/}
Copper-D	0.017	ND	Yes	Yes
Iron	7.4	363	No	
Iron-D	5.7	363	No	
Lead	0.026	ND	Yes	No ^{i/}
Lead-D	0.018	ND	Yes	Yes
Magnesium	76	63.9	Yes	No ^{h/}
Magnesium-D	76	63.9	Yes	No ^{h/}
Manganese	6.7	1.34	Yes	Yes
Manganese-D	1.0	1.34	No	
Mercury	0.00032	ND	Yes	No ^{g/}
Mercury-D	0.00077	ND	Yes	Yes
Nickel	ND	ND	No	
Nickel-D	ND	ND	No	
Potassium	1.7	<0.6 ^{i/}	Yes	No ^{h/}
Potassium-D	2.3	<0.6	Yes	No ^{h/}
Selenium	0.0098	ND	Yes	Yes
Selenium-D	0.0054	ND	Yes	No ^{g/}

TABLE 5.4
COMPARISON OF MAXIMUM SITE GROUNDWATER CONCENTRATIONS
TO BACKGROUND CONCENTRATIONS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	Maximum Detected Site Concentration ^{a/} (mg/L) ^{b/}	Background ^{c/} Concentration (mg/L)	Maximum Site Concentration Exceeds Background	Retained for Comparison to PRGs
Silver	ND	<0.005	No	
Silver-D	0.019	<0.005	Yes	Yes
Sodium	35	11.3	Yes	No ^{h/}
Sodium-D	36	11.3	Yes	No ^{h/}
Thallium	0.013	ND	Yes	Yes
Thallium-D	0.0062	ND	Yes	No ^{g/}
Vanadium	ND	ND	No	
Vanadium-D	ND	ND	No	
Zinc	0.060	0.028	Yes	Yes
Zinc-D	0.022	0.028	No	

^{a/} Maximum detected site concentration based on June/July 1997 groundwater sampling event.

^{b/} mg/L = milligrams per liter.

^{c/} Source: (IT, 1997d). Background concentrations represent the 95 percent upper confidence limit (UCL) on the mean (see Appendix E).

^{d/} Unless otherwise noted, value shown represents total (unfiltered) analyte concentration.

^{e/} D = dissolved concentration of analyte.

^{f/} ND = not detected.

^{g/} The highest detected concentration for each analyte is retained for further analysis.

^{h/} Essential human nutrients are omitted from further analysis.

^{i/} Since the lead concentration is compared to an 'at the tap' federal action level for drinking water in the subsequent table, the dissolved lead concentration is retained for further analysis.

^{j/} < = 95% UCL value for background not determined, but is less than the value shown.

TABLE 5.5
COMPARISON OF 95-PERCENT UCL SITE GROUNDWATER CONCENTRATIONS
TO SCREENING CRITERIA
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	95-Percent UCL Detected Site Concentration ^{a/} (mg/L) ^{b/}	PRG - Industrial Land Use ^{c/} (mg/L)	Maximum Site Concentration Exceeds PRG
Inorganics			
Antimony-D ^{d/}	0.057	0.0123	Yes
Arsenic-D	0.0069	0.000105	Yes
Barium	0.2	3.58	No
Cadmium	0.0226	0.0204	Yes
Copper-D	0.0069	2.41	No
Lead - D	0.0051	0.015 ^{e/}	No
Manganese	2.53	1.06	Yes
Mercury-D	0.00077	0.0092	No
Selenium	0.0098	0.303	No
Silver-D	0.019	0.298	No
Thallium	0.013	0.00486	Yes
Zinc	0.015	18	No
Semivolatile Organics			
2-Methylnaphthalene	0.070	NA ^{f/}	No
Acenaphthene	0.005	1.01	No
Bis(2-ethylhexyl)phthalate	0.022	0.00986	Yes
Carbazole	0.006	0.00795	No
Di-n-octylphthalate	0.004	0.648	No
Dibenzofuran	0.002	NA	No
Fluoranthene	0.001	0.299	No
Fluorene	0.004	0.592	No
Naphthalene	0.028	1.03	No
Phenanthrene	0.002	NA	No
Volatile Organics			
1,1-Dichloroethene	0.014	0.000225	Yes
1,2-Dichloroethane	1.2	0.00165	Yes
1,2-Dichloropropane	0.0011	0.00208	No
4-Methyl-2-pentanone	0.001	4.74	No
Acetone	0.3	6.09	No
Benzene	0.67	0.00449	Yes
Carbon Disulfide	0.0013	4.44	No
Chloroethane	0.0016	NA	No
<i>cis</i> -1,2-Dichloroethene	1.2	0.545	Yes

TABLE 5.5 (Continued)
COMPARISON OF 95-PERCENT UCL SITE GROUNDWATER CONCENTRATIONS
TO SCREENING CRITERIA
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Detected Analytes	95-Percent UCL Detected Site Concentration ^{a/} (mg/L) ^{b/}	PRG - Industrial Land Use ^{c/} (mg/L)	Maximum Site Concentration Exceeds PRG
Ethylbenzene	0.26	3.28	No
Toluene	0.012	7.85	No
<i>trans</i> -1,2-Dichloroethene	0.0041	1.09	No
Trichloroethene	1.5	0.0123	Yes
Vinyl Chloride	0.6	0.0000774	Yes
m,p-Xylene	0.24	64.9	No
o-Xylene	0.032	64.9	No
Xylene (total)	0.28	64.9	No

^{a/} 95 percent upper confidence limit (UCL) on the mean based on June/July 1997 groundwater sampling event. If 95% UCL could not be accurately determined based on the distribution, the maximum detected value was used.

^{b/} mg/L = milligrams per liter.

^{c/} Industrial Land Use preliminary remediation goal (PRG) calculated based on dose equation and standard default parameters from Ohio EPA (1993b).

^{d/} D = Dissolved concentration of analyte

^{e/} Value shown represents a federal action level for drinking water (USEPA, 1996a).

^{f/} NA = not applicable.

- Manganese;
- Thallium;
- bis(2-Ethylhexyl)phthalate;
- 1,1-DCE;
- 1,2-DCA;
- Benzene;
- *cis*-1,2-DCE;
- TCE; and
- VC.

5.2 EXPOSURE ASSESSMENT

The objective of an exposure assessment is to estimate the type and magnitude of exposures to chemicals that are present or migrating from a site (USEPA, 1989). An exposure pathways analysis describes the migration paths a chemical takes from the source of contamination to a potentially exposed individual (USEPA, 1989). Site-related contamination can present a potential risk to receptors only if exposure pathways are completed. A completed exposure pathway must consist of a source, a release mechanism (e.g., leaching or volatilization), a transport medium (e.g., groundwater or air), a potential receptor (e.g., current and future onsite workers), a potential exposure point (i.e., locations where receptors could come into contact with site-related contamination), and potential routes of exposure (i.e., ingestion, dermal contact, or inhalation). Each of these elements must be present before a particular exposure pathway can be considered completed. If any of these elements is missing, the exposure pathway is considered incomplete, and there is no risk. Thus, the overall

objective of this assessment is to determine which, if any, exposure pathways are or may be completed at the HWSA (USEPA, 1992a).

A site-specific exposure pathways analysis was completed for the HWSA to determine the likelihood of receptor contact with site-related contamination. Those exposure pathways that were considered potentially complete and significant were retained for quantitative evaluation. The potential cumulative risks to human receptors due to exposure to each COPC was then quantitatively characterized. For non-cancer effects, the potential hazards presented by all COPCs were summed for all exposure routes for each receptor. Cancer risk was summed for all COPCs and across all exposure routes for each potential receptor. Consequently, the final risk estimates account for multiple chemicals in, and receptor exposure to, the affected media. This risk assessment was prepared in accordance with *Risk Assessment Guidance for Superfund* (RAGS) documents (USEPA, 1989, 1991a-c, 1992a-e) and Ohio EPA (1993a and 1993b) guidance.

5.2.1 Conceptual Site Model

A CSM is used to qualitatively define the type of potential exposures to contaminants at and migrating from a site (i.e., to systematically evaluate the impact of chemicals in relevant media to potential receptors). The CSM describes onsite release points, the affected physical media, the types of contaminant transport mechanisms that may be involved at the site, potentially exposed current and future receptors, and how each receptor group could come into contact with site-related contamination. The CSM is used to summarize existing site characterization data, including assumptions about land and groundwater use, and to complete the qualitative exposure pathway screening assessment. A preliminary CSM, which was used to identify data gaps and guide data collection activities, was included in the June 1997 work plan (Parsons ES, 1997b). The revised CSM for this site (Figure 5.1), which is briefly discussed in the following sections, identifies only those exposure pathways that may be involved in actual or hypothetical future exposure scenarios.

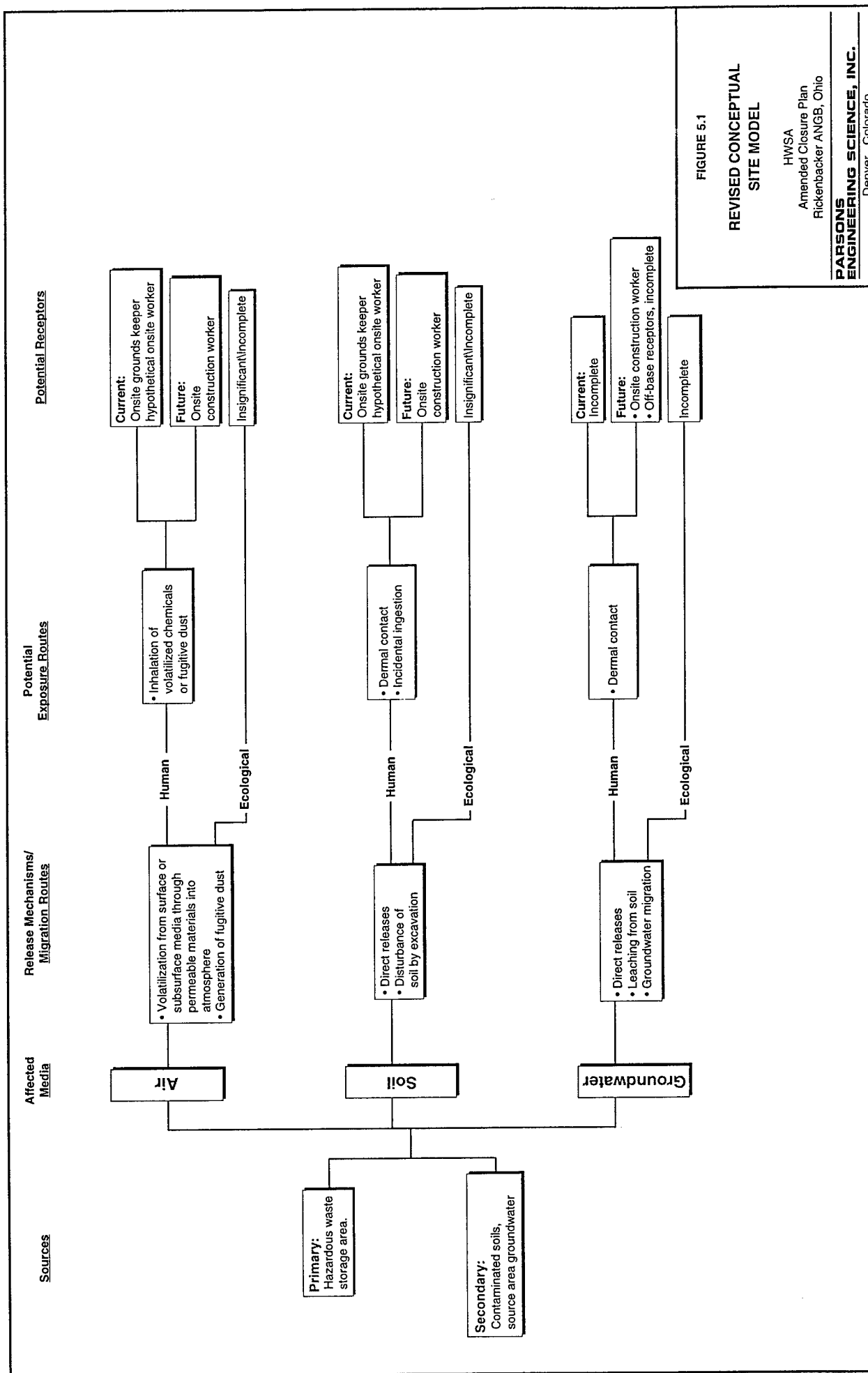


FIGURE 5.1
REVISED CONCEPTUAL
SITE MODEL

HWSA
Amended Closure Plan
Rickenbacker ANGB, Ohio
**PARSONS
ENGINEERING SCIENCE, INC.**
Denver, Colorado

5.2.1.1 Sources and Release Mechanisms

As described in Sections 3 and 4, site investigations and ongoing monitoring events have identified metals, SVOCs, fuel-related hydrocarbons such as benzene, and CAHs such as VC, as site-related contaminants in soil and groundwater at the site.

COPCs are present at the HWSA in both surface (0 to 2 feet bgs) and subsurface soils (2 to 10 feet bgs). Although it is conceivable that there may be direct exposure to COPCs in surface soil at the HWSA (e.g., inhalation of fugitive dust), direct exposure to soil COPCs (e.g., through dermal contact or incidental ingestion) is more likely to be of significance during intrusive/construction activities at the HWSA. Direct contact with COPCs in groundwater is a remote possibility in an intrusive construction scenario. Leaching of COPCs from soil and into groundwater, and subsequent offsite migration also could occur.

Volatilization of organic vapors from soil is not considered to be a significant release mechanism for undisturbed surface media. However, if subsurface soils are exposed during excavation activities, volatilization of VOCs could represent a more significant release/transport mechanism. Nevertheless, given the low volatility of the remaining COPCs in soil (metals and PAHs, Table 5.3), inhalation of VOCs is considered unlikely for either the groundskeeper or the construction worker.

There is little opportunity for fugitive dust generation within the HWSA because the majority of the site is covered with horticultural grasses and weeds. The generation of fugitive dust is further reduced because the HWSA (excluding the adjacent tank area outside of the fence) is surrounded by a chain-link fence with a locked gate; thus, minimizing surface-disturbing activity at the site. Nevertheless, it was conservatively assumed that groundskeepers may be exposed to fugitive dust while performing their activities (e.g., grass cutting) at or near the HWSA. Intrusive excavation activities within the HWSA could also result in fugitive dust exposures for future site construction workers. Consequently, exposure to fugitive dust emissions is evaluated for all current and future onsite receptors.

Exposure to COPCs in surface water can be a significant pathway on sites where direct releases from groundwater or surface runoff is a significant migration route. At the HWSA, surface water pathways are considered incomplete because of the absence of surface water drainages at or near the site, and the lack of evidence of groundwater at, or near the surface of the HWSA (groundwater is typically present at 8 to 12 feet bgs). Therefore, surface water is not included as an exposure medium in the CSM (Figure 5.1).

5.2.1.2 Contaminant Environmental Transport

Contaminant transport, transformation, and fate in the environment following a release is important to consider when assessing the potential for exposure. Due to the reducing environment of the subsurface soil and groundwater, inorganics may be subject to transport via groundwater flow. As groundwater containing mobilized inorganics move out of the area impacted by the presence of fuel hydrocarbons and the area returns to a more oxidizing environment, the inorganics should become less soluble and be removed from solution. The increased solubility and transport of inorganics observed in the reducing environment immediately downgradient from the organic contamination should be a temporary geochemical imbalance.

As discussed in Section 4.4, the extent of the fuel hydrocarbon and CAH contamination is expected to gradually decrease due to natural attenuation processes. The downgradient transport of inorganics via groundwater should also be a transient process. The extent of downgradient transport via this mechanism is expected to be limited, and is not expected to impact offsite receptors. Although the effects of offsite migration of dissolved COPCs is expected to stabilize, maximum and/or 95-percent UCL concentrations for groundwater based on current sampling results (June/July 1997) are used in this risk evaluation to assess potential risks to future receptors. A qualitative evaluation of the transport, transformation, and fate of COPCs in groundwater is provided in Section 4.4.

5.2.1.3 Potentially Exposed Populations and Exposure Routes

Once the source and release mechanisms have been determined, the routes of exposure and potential receptors need to be identified in order to determine the likelihood and extent of human or ecological receptor contact with site-related contaminants (USEPA, 1989 and 1992a). Land use assumptions are critical to defining the types of receptors that are now present or may be reasonably expected to be present in the foreseeable future at the HWSA, or in immediately adjacent areas that could potentially be impacted by site-related contamination in soils or groundwater.

5.2.1.3.1 Current Onsite Receptors

Groundskeeper

If no construction activities occur at the site, onsite groundskeepers (e.g., landscape maintenance workers) are the most likely human receptors. As previously discussed, the HWSA (except for the former tank area in the southern corner of the site) is surrounded by a chain-link fence with a locking gate resulting in little or no activity within the fence line. Because of this, incidental contact with environmental media (i.e., surface soil) by onsite workers is minimal. However, groundskeepers could potentially be exposed to COPCs via incidental ingestion of and dermal contact with contaminated soil. If it is assumed that the groundskeeper activity disturbs the surface of the soil, inhalation of fugitive dust is also possible within the HWSA, even though the majority of the site is covered with vegetation. Because groundwater is 8 to 12 feet bgs and there is no evidence of seepage near the surface, groundwater exposure pathways are considered incomplete for the groundskeeper.

Hypothetical Worker

Although there are no workers that perform daily activities within or directly adjacent to the HWSA, it was conservatively assumed that such a worker could potentially exist at the site. Thus, it is assumed that this hypothetical worker would be exposed to site soils 8 hours a day, 250 days per year, for 25 years, as directed by Ohio EPA guidance for an industrial scenario (Ohio EPA, 1993b). It is further assumed that

these workers potentially could be exposed to COPCs via incidental ingestion of and dermal contact with contaminated soil and inhalation of fugitive dust.

Construction/Utility Worker

Because it is unlikely that construction/excavation activities will occur at the HWSA in the immediate future, potential risks to construction workers are considered as a future scenario in this analysis. Although it is conceivable that a utility worker may occasionally need to excavate a utility line within the HWSA, it was assumed in this assessment that the risks associated with a future construction worker would exceed risks due to intermittent exposure of a utility worker. It is also unlikely that the same utility worker would work on a given site such as the HWSA more than once.

Trespasser

Trespassing by potential residential or recreational receptors is not a significant concern at the HWSA due to institutional and physical access restrictions (a gate house for entry onto the Base, and a chain-link fence with locking gate around most of the HWSA). There also are no environmental or man-made features that would attract unauthorized personnel to this area. Thus, trespassers are not considered potential receptors at the site.

Groundwater User

No shallow groundwater is withdrawn for use by Rickenbacker ANGB or Rickenbacker Port Authority facilities to meet potable or nonpotable water requirements (see Section 1.3.5). Because of this, onsite groundwater consumption is considered an incomplete exposure route.

Ecological Receptors

As noted earlier, the industrial nature of the HWSA, which includes a paved driveway, a decontaminated building with a concrete floor (Building 560) and a chain-link fence to limit access, precludes the existence of significant wildlife habitat. The areas surrounding the HWSA also are industrial or commercial in nature, with

runways, hangar facilities, parking lots, and a number of office buildings. Although it is possible that certain rodents or birds may enter or be near the HWSA, it can be assumed that no special concern species (i.e., threatened, endangered or rare species) frequent the site. Typically, species associated with disturbed/industrial sites are either introduced or commonly found species. During the site visit, no resident ecological receptors were identified for which soils and/or groundwater are likely contaminant exposure media. Given this information, terrestrial biota are not considered receptors at the site.

The vegetation within the HWSA is typical of a disturbed/landscaped site, consisting primarily of horticultural grasses and a variety of weeds. Although this vegetation may be exposed to COPCs in soil domesticated plants are not considered to be ecological receptors (USEPA, 1996b).

5.2.1.3.2 Future Onsite Receptors

Construction Worker - Taxiway

Based on future land use plans, it is likely that some form of construction will occur at the HWSA in the future. The most likely scenario is that the HWSA and the former tank area will be covered by a taxiway and paved support aprons. Associated airfield support facilities will be located in areas adjacent to the site. Building 560 and the surrounding area are included in Parcel D1 (Phase I) of the redevelopment plan (Section 2.3.3). Supporting documentation on the future land use of Parcel D1 based on the approved redevelopment plan is provided in Appendix A.

The construction of a taxiway could represent a short-term exposure to site contaminants for construction workers (twenty 8-hour days) because of the limited extent of intrusive work required at any one area to be graded and paved. Potential exposure routes include incidental ingestion of and dermal contact with soil, inhalation of fugitive dusts and dermal contact with groundwater. Because shallow groundwater typically is encountered at 8 to 12 feet bgs (Section 2.2.2), workers engaged in deep excavations could hypothetically come into contact with groundwater and saturated

soils. Construction of a taxiway would require relatively shallow excavation (less than 2 feet); therefore the potential for dermal contact with groundwater is extremely remote. Nonetheless, it was conservatively assumed that direct dermal contact with groundwater could possibly occur during taxiway construction. Incidental ingestion of groundwater is considered an incomplete pathway because it is even more improbable than dermal contact.

Construction Worker - Building or Hangar

The construction of a building or hangar would result in a slightly longer-term exposure for construction workers (90 8-hour days) to site contaminants because of their potential for intrusive work within the HWSA. Potential exposure routes include incidental ingestion of and dermal contact with soil, inhalation of fugitive dusts, and dermal contact with groundwater. If a building or hangar is constructed onsite, deeper excavation may occur than that assumed for the taxiway scenario. However, substantial worker contact with site groundwater is still unlikely because basements and deep building foundations are not typically built in the area because of the relatively high water table (Friedstrom, 1997). Nevertheless, dermal contact with groundwater is conservatively assumed in the analysis. Incidental ingestion of groundwater is considered an incomplete pathway in this scenario.

Utility Worker

As discussed in Section 5.2.1.3.1, it is assumed that a utility worker scenario would be similar to a construction worker scenario but less frequent and shorter exposures would occur. Because of this, a future utility worker scenario was not included in this analysis.

Groundskeeper

It can also be concluded that there would be little or no future exposure of groundskeepers in the area following construction of a taxiway, hangar or building. If part of the HWSA remains uncovered following the construction of the taxiway, there may be limited exposure of a groundskeeper cutting grass along the edge of the

taxiway. However, the potential for exposure would be less than or equal to the current exposure scenario proposed for a groundskeeper. Because of this, the keeper is considered only as a current onsite scenario.

Ecological Receptors

Future ecological receptors are considered insignificant or nonexistent, particularly if a taxiway, hangar, or building is built over the HWSA. The rationale for concluding that ecological pathways are incomplete is similar to the rationale described in Section 5.2.1.3.1 for current ecological pathways.

5.2.1.3.3 Current and Future Offsite Receptors

The use of groundwater from the UWBZ is the only conceivable offsite receptor exposure scenario associated with COPCs originating from the HWSA. As discussed in Section 1.3.5, very few residents use private wells screened in the UWBZ in the area surrounding Rickenbacker ANGB and RPA facilities. The nearest offsite well is 1.5 miles southwest of the HWSA. Considering the relative stability of the contaminants in groundwater (Sections 4.2 and 4.4) and the substantial distance from the site to offsite wells, there is no reason to assume that COPCs associated with the HWSA could potentially affect the water quality in these offsite well locations. Therefore, offsite receptor exposures to COPCs in groundwater associated with the HWSA are considered unlikely. Nonetheless, Rickenbacker ANGB will propose institutional controls for the HWSA and other groundwater contaminated sites at the Base, through deed restrictions, to ensure shallow groundwater is not extracted for potable or nonpotable use (Friedstrom, 1997).

5.2.1.4 Summary of Potentially Completed Exposure Pathways

Incidental exposure to onsite COPCs in surface soil and associated fugitive dust are considered completed pathways for the nonintrusive groundskeeper and the hypothetical onsite worker. Incidental exposure pathways for COPCs in groundwater to these receptors are considered incomplete because of the typical depth to groundwater (8 to 12 feet bgs).

For intrusive construction workers, exposure to COPCs may occur through incidental ingestion of and dermal contact with surface and subsurface soils, inhalation of fugitive dust, and dermal contact with COPCs in groundwater. Although exposure to shallow groundwater is unlikely unless deep excavation activities occur at the site, it was conservatively assumed that the proposed construction of a taxiway or the construction of an airfield support structure (building or hangar) could result in dermal contact with groundwater. The ingestion of groundwater during construction activities is highly unlikely, therefore, this potential pathway is considered incomplete in this analysis.

Because of the nature of the site (an industrial/disturbed site), significant use of the site by ecological receptors appear to be limited or nonexistent. Therefore, ecological pathways are considered incomplete in this analysis.

5.2.2 Estimating Exposure-Point Concentrations

The representative exposure-point concentration is defined as the concentration that represents the highest exposure that could reasonably be expected to occur for a given exposure pathway. This value is intended to account for both the uncertainty in environmental data and the variability in exposure parameters (USEPA, 1992a). The 95-percent UCL concentrations of all COPCs in the affected media served as RME exposure-point concentrations for each exposure pathway considered in the risk assessment.

Fugitive dust in outdoor air may contain SVOCs and metals found in the soil at the HWSA. Although the potential for fugitive dust emissions is low under relatively nondisruptive conditions (i.e., activities performed by groundskeepers and hypothetical onsite workers), intrusive construction workers could generate fugitive dust during deep excavation activities. Concentrations of fugitive dust were developed by calculating a particulate emission factor (PEF) based on USEPA (1996c) guidance for the intrusive and the nonintrusive onsite workers. The use of a PEF allows development of

estimated concentrations to which receptors could be exposed via inhalation of contaminated surface dust.

To more accurately simulate intrusive construction conditions, it was assumed that there is no vegetative cover present at the site. Due to the potentially invasive nature of construction activities, it also was assumed that intrusive construction workers could be exposed to fugitive dust from subsurface soil as well as from surface soils. Thus, the COPC concentrations in fugitive dust to which the construction worker could be exposed via inhalation was assumed to originate from representative COPC soil concentrations from 0 to 10 feet bgs at the HWSA (i.e., the statistically derived exposure-point concentration for soil).

5.3 QUANTIFICATION OF EXPOSURE: CHEMICAL INTAKES

Once the exposure pathways are described qualitatively and the exposure concentrations are defined quantitatively, the amount of any one chemical to which a receptor may be exposed during a specified time is estimated. Calculating chemical intakes hinges on reasonable, yet conservative, assumptions about how each group of potential receptors at a particular site may be exposed to site-related contamination. This step in the risk assessment process is called quantification of exposure. The risks to potential receptors exposed to site-related contamination are then estimated by coupling toxicity data with quantified exposure data.

Intake estimates are normally expressed as the amount of chemical at the exchange boundary in milligrams of contaminant per kilogram of body weight per day (mg/kg-day), which represents an intake normalized for body weight over time. The total exposure is then divided by the time period of interest to obtain an average exposure over time. The time used to average exposure is a function of the toxicity endpoint: for noncarcinogenic effects it is the exposure duration, and for carcinogenic effects it is a lifetime (70 years).

This risk assessment is based on chronic exposures to measured COPC concentrations. Short-term (i.e., subchronic) and acute exposures are not evaluated in this risk assessment. Although intrusive construction workers are assumed to have subchronic exposures, risks are evaluated using chronic toxicity values to be more conservative (health-protective). As required by USEPA (1992c) and Ohio EPA (1993b), an RME exposure scenario is used in this risk assessment. When coupled with the appropriate toxicity information, intakes calculated using the RME exposure parameters result in RME risk estimates.

Where appropriate, standard default intake variables as defined by USEPA (1991c) and Ohio EPA (1993b) were used in quantifying exposure for the intrusive construction worker (e.g., body weight, breathing rate, lifetime). However, some intake variables, particularly for the construction worker, are based on best professional judgment. For example, the taxiway construction worker is conservatively assumed to remain at the job site for an equivalent of 20 8-hour days. This assumption is based on best professional judgment of a field engineer at Rickenbacker ANGB (Haines, 1997). Twenty days is a conservative value because excavation activities likely would take only 3 work days (the other 17 days are related to construction of the concrete pavement - see Appendix G). It is also conservatively assumed that excavation would reach the upper water-bearing zone (8 to 12 feet bgs) at the HWSA even though excavation for a taxiway is typically 2 feet deep.

An exposure scenario with a more detailed construction-related activity (e.g., building a foundation) is included in this analysis for comparison. This scenario assumes that the construction worker would spend up to 3 months performing construction-related activities where exposure to site contaminants in soil and groundwater would be possible. This scenario is also very conservative, as the depth of a foundation or support piers for existing buildings or hangars at Rickenbacker ANGB is typically well above the UWBZ (8 to 12 feet bgs). Finally, workers involved in excavation activities would not remain at the site once the foundation or pavement has been poured and the aboveground construction activities have been initiated.

Calculation of dermal exposure to groundwater also required development of several additional intake variables. An exposed surface area of 5,000 square centimeters (cm²) was used based on the assumption that an adult worker's hands, arms and head would not be covered by clothing, and therefore could be exposed to contaminated groundwater. Consistent with the development of other exposure parameters, the exposure assumption for dermal contact with groundwater was developed to characterize an RME.

If groundwater is encountered during construction, dermal contact by a construction worker is not likely to be continuous over an 8-hour work day. Therefore, it was conservatively assumed that a construction worker would be in contact with groundwater for 50 percent of the 8-hour work day (i.e., exposure time [ET] = 4 hours).

A chemical-specific permeability constant (Kp) value was used to calculate dermal intakes from groundwater. All Kp values were either calculated or obtained from USEPA (1992e) *Dermal Exposure Assessment: Principles and Applications*. Using these Kp values, a dose absorbed per unit area per event (DA_{event} in mg/cm² per event) was calculated. The intake variables, resulting exposure factors, and the formulas used to calculate intake for intrusive construction workers and nonintrusive groundskeepers and hypothetical onsite workers are shown in Appendix G.

Dermal absorption factors for soil were developed based on studies of absorption from soil (USEPA, 1992e; California Environmental Protection Agency, 1994). Ten percent of most organics, and one percent of inorganics were assumed to be absorbed dermally, unless chemical-specific absorption factors were available.

A groundskeeper was conservatively assumed to work at the HWSA (e.g., cutting the grass and weeds) six times per year for 5 years. It is also assumed that the task would take up to 8 hours to complete, even though the HWSA is a small site. These assumptions are based on professional judgment and are conservative particularly,

because it is unlikely that the same individual would perform the activity each time, for 8 hours, for 5 years.

It is conservatively assumed that the hypothetical onsite worker would remain at the site 8 hours per day, 250 days per year for 25 years. Although these exposure durations are very unlikely given the nature of the HWSA site, this scenario reflects the standard assumptions for an industrial worker scenario (Ohio EPA, 1993b).

5.4 TOXICITY ASSESSMENT

The objective of the toxicity assessment is to weigh available evidence regarding the potential for particular contaminants to cause adverse effects in exposed individuals and to provide, where possible, an estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects. For humans, USEPA has conducted numerous toxicity assessments that have undergone extensive review within the scientific community.

The types of USEPA toxicity values used in this risk assessment include oral reference doses (RfDs), inhalation reference concentrations (RfCs), oral carcinogenic slope factors (CSFs), and inhalation unit risk factors (IURs). RfDs and RfCs are used to evaluate systemic (noncancer) effects. CSFs and IURs are used to evaluate carcinogenic effects. Toxicity values for the noncarcinogens and carcinogens evaluated in this risk assessment are presented in Appendix G. The toxicity information used in this risk assessment was obtained from the Integrated Risk Information Service (IRIS) (Micromedex, Inc., 1997). If values were not available from IRIS, *Health Effects Assessment Summary Tables* (HEAST) values (USEPA, 1995) were used. In some cases, toxicity values have either been withdrawn or are provisional. For example, there is currently no RfD or CSF for TCE. Because of the potential importance of TCE, provisional values were used in this assessment.

USEPA has not derived toxicity values for all routes of exposure. Most of the available toxicity values are for oral exposure, although many inhalation values are available. No values are currently available for dermal exposure. Dermal toxicity values were developed by modifying oral toxicity values with chemical-specific oral absorption factors (Appendix G). For those chemicals for which toxicity values are not available for any route of exposure, it may be appropriate to use toxicity values derived for similar chemicals (i.e., surrogates). This is appropriate for chemicals where the toxicity values for one chemical may be used for another related chemical (e.g., polynuclear aromatic hydrocarbons). For most chemicals, however, there is no chemical that is similar enough to justify the use of toxicity information for a surrogate; therefore, these chemicals cannot be quantitatively evaluated in the risk assessment.

5.5 RISK CHARACTERIZATION

To characterize risk, toxicity and exposure assessments were summarized and integrated into quantitative expressions of risk. To characterize potential noncancer effects, comparisons were made between projected intakes of chemicals and chronic toxicity values. To characterize potential carcinogenic effects, probabilities that an individual would develop cancer over a lifetime of exposure were estimated from projected intakes and chemical-specific dose-response information. Major assumptions, scientific judgments, and, to the extent possible, estimates of the uncertainties embodied in the assessment were also considered in the analysis.

The current and future land uses at the HWSA were assumed to involve predominantly nonintrusive maintenance and intrusive construction activities, respectively. The RME chemical-specific hazard quotients (HQs), total HIs, and cancer risk estimates for the aforementioned exposure routes are presented in Appendix G. Table 5.6 summarizes the RME risk estimates developed for current and future receptors that could be exposed to existing levels of site contamination at the HWSA.

TABLE 5.6
SUMMARY OF QUANTITATIVE RISK ESTIMATES FOR CURRENT AND FUTURE RECEPTORS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Exposure Pathway - RME ^{a/}	HQ ^{b/}	Risk Level ^{c/}	HQ ^{b/}	Risk Level ^{c/}
Construction Worker (Intrusive)				
Incidental ingestion of soil	2.01E-03	1.59E-08	9.03E-03	7.16E-08
Dermal contact with soil	7.99E-03	2.74E-07	3.60E-02	1.23E-06
Inhalation of fugitive dusts	0.00E+00	1.35E-11	0.00E+00	6.06E-11
Dermal contact with groundwater	4.40E-01	2.70E-06	1.98E+00	1.22E-05
Inhalation of volatiles from soil	--	--	--	--
TOTAL	4.50E-01	2.99E-06	2.02E+00	1.35E-05
Groundskeeper (Nonintrusive)				
Incidental ingestion of soil	6.02E-04	2.39E-08		
Dermal contact with soil	2.40E-03	4.10E-07		
Inhalation of fugitive dusts	0.00E+00	2.02E-11		
Inhalation of volatiles from soil	--	--		
TOTAL	3.00E-03	4.34E-07		
Hypothetical Worker (Nonintrusive)				
Incidental ingestion of soil	2.51E-02	4.97E-06		
Dermal contact with soil	9.99E-02	8.55E-05		
Inhalation of fugitive dusts	0.00E+00	4.21E-09		
Dermal contact with groundwater	--	--		
Inhalation of volatiles from soil	--	--		
TOTAL	1.25E-01	9.05E-05		

^{a/} RME = reasonable maximum exposure.

^{b/} HQ = chemical-specific hazard quotients; summed across all pathways for each receptor group to obtain cumulative HI (target is cumulative < 1).

^{c/} Carcinogenic risk level; expressed as probability; summed across all pathways for each receptor group to obtain cumulative risk level (target is cumulative 10⁻⁵ for potential exposure).

5.5.1 Risk Estimates for Hypothetical Current Receptors

Ohio EPA (1995b) states that a cumulative HI greater than 1 or a cumulative carcinogenic risk greater than 10^{-5} is unacceptable and necessitates remediation and/or appropriate control measures to protect human health. The Ohio EPA (1995b) memorandum goes on to state that "when site-specific risk assessments are conducted for an industrial-use scenario, a risk goal of 10^{-4} may be used provided a demonstration is made that the cumulative risk from potential offsite exposure on neighboring property is less than 10^{-5} ". In this assessment, the risk target goal is 10^{-5} ; however, given that the HWSA is clearly an industrial site, risks that slightly exceed this goal are considered acceptable, particularly if the exposure scenario and assumed exposure pathways are unlikely.

The cumulative RME HI for a groundskeeper is 0.003, well below the threshold value of 1. The cumulative cancer risk estimate for this receptor is 4.34×10^{-7} , which is well below the Ohio EPA target of 1×10^{-5} .

The cumulative RME HI for a hypothetical onsite worker is 0.125, which is below the threshold value of 1. The cumulative cancer risk estimate is 9.05×10^{-5} . Because the potential for actual exposure for this receptor is believed to be low or nonexistent at the HWSA, and because of the hypothetical nature of this scenario, the cumulative cancer risk is believed to be acceptable even though it exceeds the target risk level (1×10^{-5}). In addition, it is below the 1×10^{-4} risk level for industrial sites discussed above. As stated earlier, there is little reason to assume that a worker would be working at this small site, 8 hours per day, 250 days per year, for 25 years.

5.5.2 Risk Estimates for Hypothetical Future Receptors

The cumulative RME HI for a taxiway construction worker is 0.45, which is below the threshold value of 1. The cumulative cancer risk estimate for the taxiway construction worker is 2.99×10^{-6} . The cumulative RME cancer risk total is below the Ohio EPA target of 1×10^{-5} , indicating an acceptable risk level. As suggested earlier, the construction of a taxiway is the most likely future scenario for the HWSA.

If a more conservative and intrusive construction scenario is considered (i.e., construction of a hangar), the cumulative HI is 2.02, and the cancer risk estimate is 1.35×10^{-5} . Because the HI is above the threshold value of 1 and the cancer risk estimate is slightly above the Ohio EPA target of 1×10^{-5} (but still below the Ohio EPA target of 1×10^{-4} for industrial sites), these risk estimates require additional consideration. In this scenario (and in the construction of the taxiway), 90 percent of the cancer risk and 98 percent of the noncancer hazard are associated with exposure to groundwater. Because of this, the conservative assumptions that are a part of this scenario need to be emphasized.

First of all, it is unlikely that a building will be constructed over the HWSA; a taxiway with support aprons is the planned future land use. A 90-day excavation period as conservatively assumed for this activity is unlikely. A more realistic excavation period is 20 days (the assumption conservatively used for the construction worker building a taxiway). It also is improbable that a construction worker would have dermal contact with groundwater given the depth to groundwater and the absence of deep foundations or basements as design elements in the area. Also, the HQs associated with antimony, cadmium and manganese (72 percent of the HI) are the result of dermal RfDs that are based on conservative chemical-specific oral absorption factors.

In addition, the inclusion of dermal absorption of metals in this risk assessment is very conservative and not uniformly considered by the USEPA as a significant exposure pathway. Within some USEPA regions, it is acceptable to assume no dermal contact exposures for metals in soil and groundwater (USEPA Region 8, 1994). If default oral absorption factors had been used for antimony, cadmium, and manganese, or if the dermal exposure pathway had been eliminated for metals, the overall HI would have been less than 1 for all scenarios shown in Table 5.6. If based on this information there is still a concern associated with the potential cancer risk and noncancer hazards, some type of institutional control (deed restrictions) prohibiting future excavations deeper than 8 feet bgs at the site may be warranted.

Even though dermal exposure to groundwater is highly unlikely, it is clear that select organics (e.g., VC and TCE) in groundwater contribute significantly to the potential risks to future construction workers. Because of this, trends associated with the concentrations of the most significant organics in groundwater over time should not be overlooked in this analysis. The reduction of VOCs (i.e., benzene, DCE, and VC) in groundwater at the HWSA as a result of natural attenuation will, with time, reduce the risks associated with groundwater exposures.

5.5.3 Summary/Discussion of Results

The results of this risk assessment demonstrate that measured concentrations of COPCs in soils and groundwater at the HWSA do not result in HQs greater than the noncancer threshold limit of 1 for any current receptor groups or for the most likely future receptor group (taxiway construction worker). While the HQ does exceed the threshold limit for the building construction worker based on extremely conservative exposure assumptions, institutional controls that prohibit excavation deeper than 8 feet bgs will ensure noncancer hazards for all receptor scenarios are less than 1. While the nonintrusive hypothetical onsite worker and the intrusive construction worker (building/hangar) scenarios slightly exceed the cancer target risk level of 10^{-5} , the exposure assumption used in these scenarios also are extremely conservative and unlikely. Nevertheless, both exceedances are still below the 10^{-4} level that is considered acceptable for industrial sites.

5.6 UNCERTAINTY CHARACTERIZATION AND ANALYSIS

All risk assessments involve the use of assumptions, judgments, and imperfect data to varying degrees. This results in uncertainty in the final estimates of hazard and risk. This section describes the likelihood that the approaches incorporated into this risk assessment either overestimate or underestimate the actual risks associated with exposure to site-related organic chemical concentrations, pursuant to Ohio EPA (1993a and 1993b) guidance. Risk assessment in general, as it is currently practiced, is highly conservative and often based on extremely conservative assumptions and scenarios.

There are several types of uncertainty associated with the risk assessment process. The first type concerns the initial selection of substances for analyses and the uncertainties associated with data quality. Another area of uncertainty involves the selection of exposure scenarios that are conservative (i.e., protective of human health), and yet are realistic and probable. Additional uncertainties are inherent in the exposure assessment for individual substances and individual exposures. Those uncertainties are driven by the degree of reliability of the chemical monitoring data, the models used to estimate exposure-point concentrations in the absence of monitoring data, and the receptor intake parameters (e.g., exposure factors). The availability of toxicity information for the COPCs at the site to address all routes of potential exposure (e.g., dermal exposure) is another area of uncertainty. Finally, additional uncertainties are incorporated into the risk assessment process when exposures to several substances are summed to develop cumulative risks.

5.6.1 Data Uncertainties

Inorganic chemicals were compared to background levels and eliminated if site concentrations did not exceed background levels. It is possible that some of the chemicals not retained for risk analysis may be present as a result of anthropogenic activities. It is possible, although unlikely, that the elimination of the anthropogenic fraction of these inorganic chemicals present at these sites could lead to an underestimation of risk. Chemicals were not eliminated from the quantitative risk assessment based on any detection-frequency analysis, and this approach possibly resulted in an overestimation of risks (e.g., SVOCs in soil).

To calculate the 95-percent UCL, chemicals detected in at least one sample were assumed to be present in all nondetect samples. Statistical analyses (mean, standard deviation, 95-percent UCL, etc.) were then performed on all data by evaluating detects in combination with nondetects. In some cases, especially for VOCs and SVOCs in groundwater, maximum values were used instead of 95-percent UCL values if a nonparametric UCL could not be accurately determined. Especially for these types of scenarios, use of the 95-percent UCL or the maximum measured concentration as the

concentration term may overestimate the overall amount of chemical present in the exposure medium and, consequently, the risk posed by the chemical.

5.6.2 Exposure Uncertainties

A significant part of a risk assessment is the estimation of risks that are based on receptor exposure; if exposure of receptors does not occur, no risks are present. Although this assessment qualitatively identifies the probability of the exposure pathway occurring, the quantitative risk estimates for those receptor groups where exposure is possible but unlikely will be overestimated. Additionally, in the risk assessment, it is assumed that each unique receptor is exposed to the same contaminant concentrations. This assumption tends to overestimate risk because each individual receptor will not realistically be exposed to precisely the same contaminant concentrations.

5.6.3 Uncertainty in Exposure-Point Concentration and Intake Values

There is also uncertainty associated with estimating exposure-point concentrations and the matrix-specific intake factors, including uncertainty associated with intake values and their respective default values for the RME exposure scenarios. Uncertainty arises in the assumption that current and future nonintrusive receptors will be exposed to a mixed (surface plus subsurface) soils stratum. By not evaluating the soil strata on a discrete basis, and assuming all strata are combined, underestimation or overestimation of risks may occur. Assuming that a receptor will be exposed to the maximum concentration detected, regardless of the soil strata from which the detection occurred, could result in an overestimation of risk. In groundwater and soil, exposure-point concentrations are assumed to remain constant over time, while all organic compounds are subject to concentration decreases due to destructive and non-destructive attenuation mechanisms (Section 4.4).

The models used to estimate exposure via a particular route can introduce a considerable amount of uncertainty. In particular the calculations of dose for dermal exposure to groundwater or soil introduce relatively large amounts of uncertainty. The exposure estimates incorporate several factors for which there is little chemical-specific

experimental information available (i.e., permeation rates through skin, bioavailability of chemicals bound in soil, or length of time soil remains in contact with skin). Without specific information, it is necessary to make assumptions about the behavior of chemicals in soils. Uncertainty will be introduced into the risk assessment to the degree that the assumptions used in these models are inaccurate. In general assumptions are made which will tend to make the model results conservative (health protective). For example the non-steady state model recommended by USEPA (1992e) in *Dermal Exposure Assessment: Principles and Applications* was used to calculate the dose of organic contaminant absorbed dermally from groundwater. USEPA states that this approach provides a more conservative total absorbed dose over the traditional steady-state equation.

Standard assumptions regarding body weight, duration of exposure, life expectancy, receptor population characteristics, and lifestyle were made to reflect the RME exposure to individuals for each pathway evaluated. The assumption for RME reflects a conservative (health-protective) approach. Because of this, the RME most likely will overestimate actual risk.

Exposure variables for this risk assessment were taken from current USEPA and Ohio EPA guidance, when available. However, some exposure scenario intake values are location-specific and reflect professional judgment. For example, the duration and frequency of exposure to soils via several exposure routes for the groundskeeper and the future construction worker are unknown, and professional judgment was used. Judgment was applied with the intention of overestimating, rather than underestimating the upper-bound risk estimate.

5.6.4 Uncertainty in the Toxicity Assessment

Some uncertainty is inherent in the toxicity values used for the assumed duration of exposure assessed. These uncertainties are compounded under the assumption of dose additivity for multiple substance exposure. That assumption ignores possible synergisms or antagonisms among chemicals, and assumes similarity in mechanisms of

action and metabolism. Another assumption is that all the toxicity values used have an equal degree of reliability, which in reality is not the case. Overall, these assumptions would tend to overestimate hazards and risks. Because toxicity constants for cancer generally are based on the 95-percent UCL, risks tend to be overestimated.

Not all organic chemicals detected can be evaluated quantitatively for health effects because toxicity values do not exist for all chemicals. The lack of toxicity data tends to underestimate risk, therefore, the more chemicals that lack toxicity data, the greater the tendency is for risk underestimation. To help avoid this potential underestimation, provisional or withdrawn toxicity values were used in the assessment particularly for identified COPCs (e.g., TCE).

There is uncertainty associated with the use of dermal absorption factors used in the conversion of oral toxicity values to dermal toxicity values. Use of dermal toxicity values based on converted oral toxicity values introduces uncertainty due to potential differences in point-of-entry effects and potential differences in metabolic activation/deactivation in dermally absorbed doses. This could tend to either overestimate or underestimate risk.

Whenever multiple absorption factors exist for a particular chemical, the most stringent factor for the various chemical forms was selected. This also may lead to an overestimation of risk.

Regarding noncancer health effects, the application of uncertainty factors to no-observed-adverse-effect level (NOAEL) for a chemical in an animal study for animal-to-human extrapolation adds additional uncertainty to the toxicity assessment. The application of scaling or uncertainty factors may result in an overestimation of risk.

5.6.5 Uncertainty in Risk Characterization

Uncertainties in the risk characterization process reflect the cumulative effects of uncertainties in all preceding risk analysis steps. Overall, the assumptions in this risk assessment tend to overestimate risk. The results of the risk assessment are supported

by the risk screening evaluation for all analytes presented in the work plan and expanded in Section 5.1. The "risk-drivers," arsenic in soil and VC and TCE in groundwater, were identified as potentially significant site-related COPCs based on the comparison between maximum concentrations and conservative industrial PRGs.

5.7 SITE-SPECIFIC TARGET LEVELS

The results of this risk assessment were used as the basis for developing SSTLs (i.e., risk-based health standards) for COPCs in impacted media at the HWSA. The primary intent for developing these standards that include exposure assumptions more representative of actual site conditions are to determine whether current or future site concentrations of COPCs present an unacceptable risk to current and future receptors and to provide a mechanism or reference to compare against during confirmation sampling.

The objective of developing SSTLs is to define the concentration for each COPC that can persist in onsite environmental media and not result in an individual risk greater than 1×10^{-5} for carcinogenic chemicals or an HQ of 1 for noncarcinogenic chemicals for each receptor group given the site-specific exposure assumptions incorporated into the risk assessment.

The risk calculations indicate that the major chemical contributors to cumulative risks are VC and TCE in groundwater (Appendix G). However, the individual estimated risk due to exposure to any specific COPC for each route of exposure considered in the risk assessment is essentially less than 1×10^{-5} . This means that the individual concentrations of COPCs in both soil and groundwater are not sufficient to cause unacceptable carcinogenic health risks.

The exposure assumptions used in the risk assessment were used to derive the SSTLs. Because groundwater represented 90 percent of the cancer risk and 98 percent of the noncancer risks for the construction worker scenarios, SSTLs for groundwater were developed for comparison against future confirmatory sample results. SSTLs

were not developed for COPCs in soil based on the relatively low risk posed by chemicals in this medium. Table 5.7 presents the SSTLs for groundwater that are protective of onsite construction workers and compares these standards to the maximum detected and 95-percent UCL concentrations for groundwater based on the June/July 1997 groundwater sampling event. Calculations used in the development of these SSTLs are shown in Appendix H.

As can be seen from Table 5.7, the maximum measured concentrations of 1.5 mg/L for TCE and 0.6 mg/L for VC, the most significant groundwater COPCs, are below the respective SSTLs of 21.6 mg/L and 2.9 mg/L for the taxiway construction worker scenario. These same concentrations also are below the SSTLs derived for the building construction scenario. For bis(2-ethylhexyl)phthalate, the only groundwater SVOC retained for further evaluation in the risk assessment, the maximum detected concentration (during the June/July 1997 sampling event) is approximately 3 to 4 orders of magnitude less than the SSTLs shown. Considering the taxiway worker exposure scenario, bis(2-ethylhexyl)phthalate contributes only 1 percent of the cancer risk and less than 1 percent of the noncancer risk for the groundwater dermal contact route (Appendix G). The only SSTL exceedance based on June/July 1997 sample results is antimony under the building construction worker scenario. The primary reason for this exceedance is the result of noncancer risks exceeding 1 because conservative chemical-specific oral absorption factors were used to develop the dermal RfD for antimony (Section 5.5.2). Given this SSTL exceedance, it is important to reemphasize that unacceptable noncancer hazards only result for antimony if a construction worker is in direct dermal contact with groundwater for 90 days. These health standards for groundwater reiterate the findings of the risk assessment: exposure pathways involving groundwater, given the type of exposure that is likely to occur at these sites, do not result in significant human health risks.

The impact of natural chemical attenuation processes on COPC concentrations at potential exposure points was not incorporated into the development of these SSTLs. If

TABLE 5.7
SITE-SPECIFIC TARGET LEVELS FOR COPCs IN GROUNDWATER
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Compound	Units	Maximum Site Concentration	95-Percent UCL Concentration ^{b/}	Site-Specific Target Levels ^{a/}	
				Intrusive Worker ^{c/}	Building ^{d/}
Antimony	mg/L ^{e/}	0.057	0.057	0.256	0.0568 ^{f/}
Arsenic	mg/L	0.019	0.0069	15.3	3.41
Cadmium	mg/L	0.034	0.0226	0.639	0.142
Manganese	mg/L	6.7	2.53	44.1	9.79
Thallium	mg/L	0.013	0.013	5.11	1.14
Bis(2-ethylhexyl)phthalate	mg/L	0.022	0.022	84.2	18.7
1,1-Dichloroethene	mg/L	0.014	0.014	4.19	0.931
1,2-Dichloroethane	mg/L	1.2	1.2	83.5	18.6
Benzene	mg/L	0.67	0.67	69.8	15.5
cis-1,2-Dichloroethene	mg/L	1.2	1.2	51.1	11.4
Trichloroethene	mg/L	1.5	1.5	21.6	4.79
Vinyl Chloride	mg/L	0.6	0.6	2.9	0.645

^{a/} Site-specific target levels (SSTLs) calculated using reasonable maximum exposure (RME) assumptions to derive concentrations which prevent carcinogenic and/or systemic toxic impacts to onsite workers (Appendix H).

^{b/} 95-percent upper confidence limit (UCL) on the mean based on June/July 1997 groundwater sampling event. If 95-Percent UCL concentrations could not be accurately determined, the maximum detected value was used (Appendix E).

^{c/} Intrusive worker assumed to be exposed to groundwater via dermal contact (Appendix G).

^{d/} SSTLs based on site-specific parameters associated with a taxiway construction worker scenario.

^{e/} SSTLs based on site-specific parameters associated with a building or hangar construction worker scenario.

^{f/} mg/L = milligrams per liter.

^{g/} 95-Percent UCL site concentrations that exceed SSTLs are identified by shading.

current and future site concentrations are below these target levels, land use controls, implemented in the form of a deed restriction, would afford the desired level of protectiveness (i.e., carcinogenic and noncarcinogenic risks would be below the threshold risk levels established by Ohio EPA and USEPA). If a building is to be constructed at the site (instead of a taxiway and/or support aprons) and the excavation is expected to be greater than 8 feet bgs and site COPC concentrations (e.g., antimony) persist at levels above the SSTLs established for the building construction worker scenario, then contingency actions may be necessary.

SECTION 6

IMPLEMENTATION OF PROPOSED CLOSURE ACTIVITIES

This section describes the actions proposed to be implemented at the HWSA to facilitate closure of the unit. Additional soil, soil gas, and groundwater sampling at the HWSA has been performed to supplement site data from earlier investigations in determining the nature and extent of contamination at the site, and for use in a site-specific risk assessment based on current and future land use scenarios. The risk assessment demonstrated that concentrations of organic and inorganic compounds in soil and groundwater do not pose unacceptable carcinogenic risks or noncancer hazards to current or future receptors. It also was shown that extensive dermal contact with site groundwater, while unlikely, represents the most significant potential human receptor exposure pathway. Considering these findings a closure approach based on continued groundwater monitoring for eight consecutive quarters and institution of land-use controls is proposed. Post-closure monitoring which was proposed in the February 1997 amended closure/post-closure plan (Parsons ES, 1997a) will not be necessary considering the proposed risk-assessment based closure and completion of confirmation monitoring during the closure period.

6.1 PROPOSED CLOSURE APPROACH

To implement closure of both soils and groundwater, the following activities have been completed or are proposed to be completed:

- Removal of the remaining four USTs (completed February 1995);
- Decontamination of Building 560 by cleaning the building and the drum wash pad (completed April 1996);

- Installation of 10 new monitoring wells in the vicinity of the HWSA and comprehensive groundwater sampling from 37 site monitoring wells (completed July 1997);
- Sampling of soil and soil gas in the vicinity of Building 560 (completed August 1997);
- Treatability testing for determination of the effectiveness of air injection bioventing, in the event residual organic soil contamination required limited remediation based on the findings of the risk assessment (completed August 1997);
- Treatability testing for determination of the effectiveness of air sparging near ESMP-17S in the event groundwater in the vicinity of the site required *in situ* remediation based on the findings of the risk assessment (completed December 1997);
- Establishment of risk-based SSTLs (health standards) for the HWSA based on a comprehensive site risk assessment (results presented in Section 5);
- Natural oxidation of dissolved BTEX and natural reductive dehalogenation of dissolved chlorinated VOCs (in progress);
- Installation of one additional monitoring well cluster downgradient of MW-101S and MW-101D in order to completely delineate the extent of the chlorinated VOC plume (proposed);
- Continued monitoring of the groundwater COPCs identified in the risk assessment (proposed). Based on the findings presented in Section 4 and Section 5, a revised monitoring well network is shown on Figure 6.1 and discussed in Sections 6.3.1 and 6.3.2;

- Institution of land-use controls through a deed restriction upon transfer of the HWSA property (proposed); and
- Eventual exposure control by installation of taxiway (proposed as future land use).

6.2 ACCESS CONTROL

During closure activities, the site will be secured with a chain-link fence, with padlocked gates to limit access in compliance with OAC 3745-68-9. The fence will be removed prior to construction of the taxiway or implementation of contingency actions, if necessary. Limiting access to the site will be unnecessary following construction of the taxiway.

6.3 CLOSURE FIELD ACTIVITIES

Many of the activities to be completed as a part of the closure will be field-related activities. These activities are described in detail below.

Because of known contamination in groundwater, an alternate groundwater monitoring system, in accordance with OAC 3745-65-90 (D), has been implemented at the site. The current monitoring network as detailed in the February 1997 amended closure/post-closure plan (Parsons ES, 1997a) relies on quarterly sampling from 19 monitoring wells installed prior to 1997. While this network complies with OAC 3745-65-91 (A, B, C) and 3745-65-92 (A, E), it does not incorporate the findings of the 1997 assessment activities (Section 4) or the site-specific risk assessment (Section 5) as presented in this amended closure plan. The monitoring network and sampling and analysis procedures as outlined below comply with the above-cited OAC rules, and consider findings that have been previously reported. Upon Ohio EPA approval of this closure plan, the following expanded monitoring well network will be established and sampled.

6.3.1 Monitoring Well Installation

Twenty monitoring wells or points will be used to conduct quarterly monitoring at the site (Figure 6.1). Eighteen of these sampling locations have been used to define the nature and extent of contamination at the site prior to, and/or during, closure activities. However, two additional sampling points will be required to determine the downgradient extent of chlorinated VOC contamination in groundwater. Also, the three 0.5-inch ID monitoring points (ESMP-12S, -13S, and -17S) in the proposed monitoring network will be abandoned and replaced with 2-inch monitoring wells screened at the same depths as the existing monitoring points.

Besides the replacement of ESMP-12S, -13S, and -17S, two additional wells (one shallow and one deep) will be installed and sampled as part of closure confirmation sampling activities. These two wells will be installed approximately 60 feet downgradient from monitoring wells MW-101S and D, and will be used with other site monitoring wells to assess the extent of dissolved contamination downgradient from the HWSA. Based on the sand zones encountered during the drilling of MW-101S and D, the new wells will be drilled to depths of approximately 13.5 and 21.5 feet bgs, and completed as described in OAC 3745-65-91 (C). These wells and the other 18 wells shown on Figure 6.1 will be sampled using methods described in Appendix I. Groundwater samples collected from these wells will be used to confirm site groundwater compliance with the SSTLs presented in Section 5.7.

6.3.2 Groundwater Monitoring, Sampling and Analysis

Following the installation of the new well pair downgradient from MW-101S and D, the 20 wells comprising the monitoring well network to be used during closure monitoring (Figure 6.1) will be sampled for eight consecutive quarters for the analytes listed in Table 6.1. Maximum detected concentrations from each quarterly monitoring event will be compared to the risk-based SSTLs listed in Table 6.1 to ensure that dissolved COPC concentrations remain below levels developed to be protective of human health and the environment, considering future land use plans (installation of a

TABLE 6.1
RISK-BASED HEALTH STANDARDS FOR
GROUNDWATER COMPLIANCE MONITORING
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO

Analyte	Groundwater Health Standard ^{a/} (mg/L) ^{b/}
<u>Metals ^{c/}</u>	
Antimony	0.256
Arsenic	15.3
Cadmium	0.639
Manganese	44.1
Thallium	5.11
<u>Volatile Organics ^{d/}</u>	
1,1-Dichloroethene	4.19
1,2-Dichloroethane	83.5
Benzene	69.8
cis-1,2-Dichloroethene	51.1
Trichloroethene	21.6
Vinyl Chloride	2.9

^{a/} Health standards based on the site-specific target levels (SSTL) for a construction worker installing a taxiway and site-specific determination of groundwater concentrations which do not present cancer risks greater than 10^{-5} and noncancer hazards greater than 1.

^{b/} mg/L = milligrams per liter.

^{c/} Analyzed by USEPA Method SW6010A by trace instrumentation (Appendix I).

^{d/} Analyzed by USEPA Method SW8260 (Appendix I).

taxiway) for the site. In addition, sampling results will be used to confirm stability of metals contamination and the CAH plume, and to ensure downgradient migration does not extend beyond the Rickenbacker ANGB boundary (Hangar Avenue). Results of these groundwater monitoring activities will be submitted to Ohio EPA in an annual report as required by OAC 3745-65-93. If analytical results remain below the SSTLs listed in Table 6.1 for eight consecutive quarters, and the existing contaminant plume remains stable, a petition for a risk-based closure will be submitted.

Groundwater samples will be collected in accordance with methods described in Appendix I. Groundwater samples will be collected for analysis of VOCs by USEPA Method SW8260 and for the five metals shown in Table 6.1 by USEPA Method SW6010A by trace instrumentation. Samples will be collected and groundwater elevations will be determined during each quarterly monitoring event. Based on their relative immobility, low frequency of detection (Section 4.2.2.2 and Appendix E), and low contribution to site risk (Section 5.7), groundwater samples will not be analyzed for SVOCs.

6.3.3 Site Inspection and Maintenance

Applicable RCRA interim status requirements described in OAC 3745-66-13(b)(2) will be maintained during closure activities to prevent threats to human health and the environment. The applicable requirements include the following:

- Maintenance of site security through the upkeep of the existing fence, prevention of unauthorized entry, and preventing unnecessary physical contact with or disturbance of contaminated media;
- Training site personnel in proper hazardous waste management procedures (see Appendix J);
- Maintaining communication regarding the site with local police, fire, and spill response authorities; and

- Continued groundwater monitoring to confirm continued compliance with established risk-based health standards (SSTLs) for the site.

During each of the quarterly groundwater monitoring events, the site will be inspected, and regular maintenance and repair activities will be completed. The site building (Building 560), fence, gate, and padlocks will be inspected for damage due to use, abuse, wear, vandalism, or weathering. If any damage is noted during the quarterly inspections, the damage will be immediately repaired or damaged items will be replaced. All damage and repair or maintenance actions will be noted in a field logbook and in the annual report to the Ohio EPA.

For the groundwater monitoring network, the inspection program will consist of checking each well for the following:

- Damaged protective casings;
- Damaged well casings;
- Missing or damaged well covers, caps, or locks;
- Presence of foreign objects in wells;
- Heaving or subsidence of the wells;
- Damaged concrete pads;
- Silting of the wells; and
- Other signs of unauthorized use, abuse, vandalism, or deterioration.

If any of the above circumstances are observed, they will be noted in the dedicated field log book. The missing or damaged items will be repaired or replaced within 30 days, as appropriate. A record of any observations and repair/replacement activities will be included in the annual report.

6.3.4 Site Survey

The location and dimensions of the fenced area (HWSA) will be determined by a registered professional surveyor with reference to permanently installed and protected onsite benchmarks. The survey data will be used to prepare and maintain a survey plat of the HWSA, which will be kept at the Base. If it is determined through the deed restriction and deed transfer process that areas downgradient from the HWSA also will be subject to land use controls, then these areas also will be surveyed and included in the survey plat.

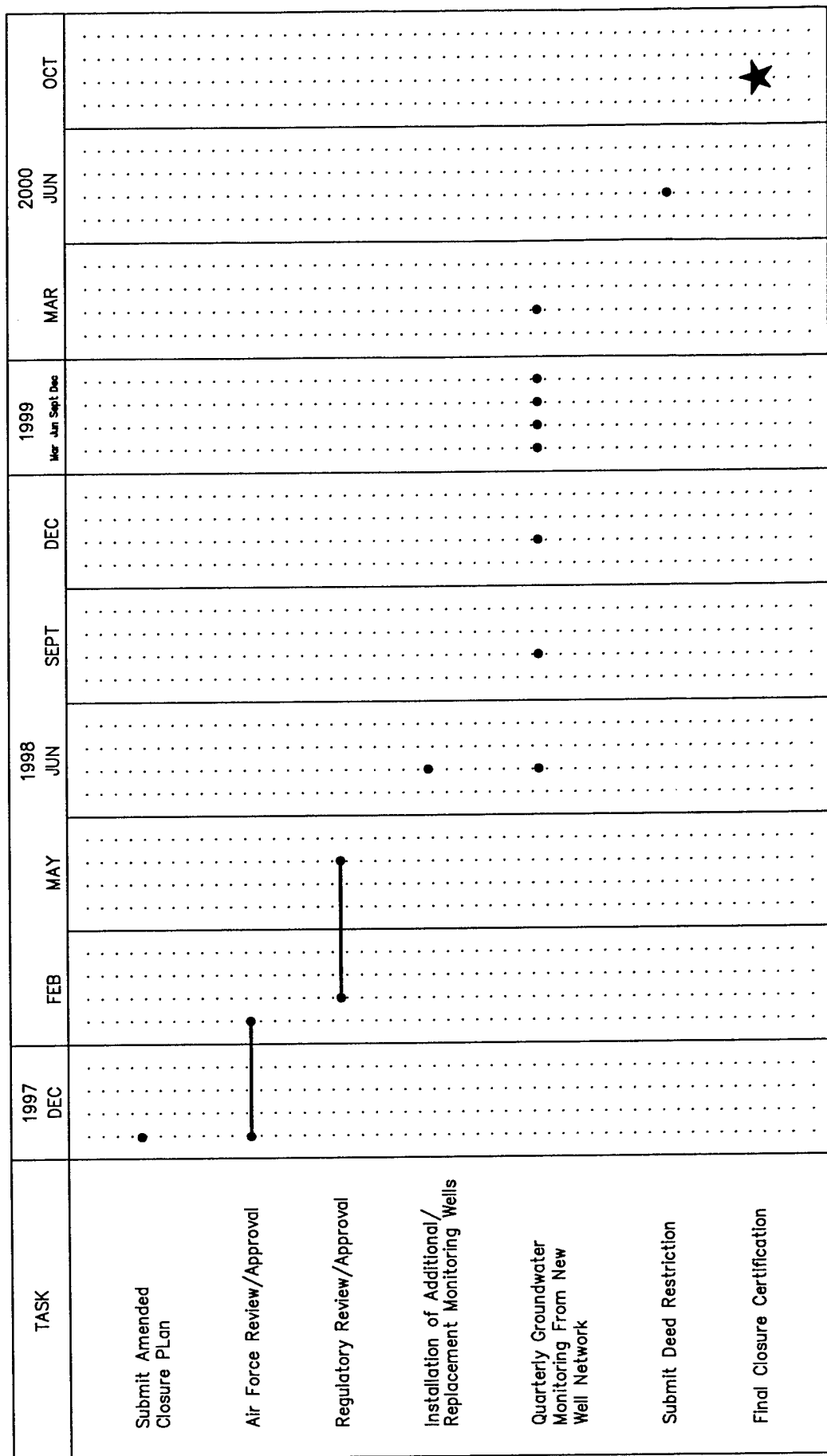
6.4 CLOSURE SCHEDULE

Figure 6.2 presents the schedule for the implementation of this closure plan. Each of the tasks is considered a major activity, and the Ohio EPA will be notified at least 5 days prior to initiating each task except for planned quarterly groundwater sampling. Time has been allowed in the schedule for the review and approval of all permit applications by, Ohio EPA, and other appropriate regulatory agencies. The AFBCA anticipates requesting site closure from Ohio EPA by October 2000; however, scheduled implementation and site closure rely on timely review and approval of required tasks.

6.5 CONTINGENCY PLAN

Should the proposed closure approach fail to retard dissolved contaminant migration and/or achieve the closure objectives for this site (compliance with the risk-based health standards listed in Table 6.1), there should be no significant impact on the land use plans for the site. Industrial land use has been proposed; the site soon will be covered by a concrete taxiway to be constructed by the RPA. Because 90 percent of the cancer risk and 98 percent of the noncancer risk is related to potential dermal contact with groundwater for future construction scenarios, exposure controls should be implemented to prevent potential receptors (e.g., onsite construction workers) from coming into direct contact with impacted groundwater.

FIGURE 6.2 SCHEDULE FOR CLOSURE HAZARDOUS WASTE STORAGE AREA RICKENBACKER ANGB, OHIO



Contingency actions would only be necessary if potential receptors may be subject to unacceptable exposure and/or if compliance with risk-based health standards is not attained during the eight quarters of groundwater monitoring. Contingency actions would only need to be considered for implementation if the following events occurred:

- The results of at least one (1) groundwater assessment/monitoring event indicate that site-related contaminants are not in compliance with the risk-based health standards established for site groundwater (Table 6.1); or
- The results of at least two (2) consecutive groundwater assessment/monitoring events indicate that site-related contaminants are migrating beyond areas intended for industrial land use at concentrations that could pose an unacceptable risk to downgradient receptors.

If either of these events occur, an additional assessment event would be conducted to determine the extent of contamination and to locate the zone of highest contamination. As noted, the failure of the proposed closure approach will not impact the current or proposed uses of the HWSA.

Section 6.1 describes the closure activities deemed appropriate to pursue a risk-based closure of the HWSA. However, if quarterly groundwater monitoring data suggest that these approaches will not achieve the desired level of risk reduction at the site, possible contingency actions could include installation of a cover prior to taxiway construction and groundwater extraction and treatment. This level of remediation would be deemed excessive by most environmental professionals given the levels of contamination encountered at this site and the current and future uses of the land and groundwater.

6.6 AMENDMENT OF THE CLOSURE PLAN

Whenever changes in the operating plans or facility design affect the closure plan, or there is a change in the expected year of closure, or unexpected events occur during the partial or final closure activities, the closure plan will be modified by the procedures established in OAC 3745-66-12.

6.7 COST ESTIMATES

Rickenbacker Air National Guard Base is exempt from filing a closure cost estimate (40 CFR 265.142 and .143) because it is owned and operated by the federal government. However, preliminary cost estimates have been previously provided to support potential subsequent decision making regarding the need for, and cost of, contingency actions at the HWSA. Based on estimates presented in the February 1997 amended closure/post-closure plan (Parsons ES, 1997a), the estimated cost for risk-based closure of the HWSA, including additional well installation and quarterly confirmation groundwater sampling for 2 years, is approximately \$200,000. The estimated costs for contingency actions at the HWSA, including design and installation of a cover and installation and maintenance of an onsite groundwater extraction and treatment system exceed \$2,500,000 (Parsons ES, 1997a).

6.8 CLOSURE NOTICES

6.8.1 Annual Groundwater Monitoring System Reports

Groundwater sampling reports will be submitted to the Ohio EPA annually during facility closure activities. These reports will include the following information:

- Results of site inspection and maintenance activities;
- Groundwater elevation data;
- An evaluation of the groundwater surface elevations;
- Results of groundwater analyses;
- An evaluation of the analytical results;
- A determination of the rate and extent of contaminant migration; and
- Any other pertinent data or information.

6.8.2 Record of Hazardous Waste Disposal

As stipulated in OAC 3745-66-19, a record of the type, location, and quantity of hazardous wastes disposed of at the site will be submitted to the Ohio EPA and the local zoning authority no later than 60 days after the certification of closure.

6.8.3 Deed Restriction Notation and Certification

A notation will be recorded on the facility property deed in accordance with OAC 3745-66-19. A certification stating that said notation was made, and a copy of the document in which the notation was placed, will be submitted to the director of the Ohio EPA within 60 days of certification of closure.

The Closure Certification and Closure Plan will ensure a risk-based closure under the industrial scenario requiring no further remediation. The AFBCA will cause, through the sale and transfer of the property the filing of a notice and deed restriction to restrict future land use of the property, other than industrial within the Franklin County Recorder's Office. In addition, land-use controls will be instituted through the deed restriction that minimize contact with site groundwater. These include the following:

- Restriction of potable and nonpotable water extraction and use from the UWBZ at the site (0 to 40 ft bgs); and
- Restriction of excavations deeper than 8 feet bgs.

Because the deed restriction for the HWSA will not be developed until the time of deed transfer, specific deed restriction language for the site is not submitted with this plan. Example deed restriction language similar to that which will be required for the HWSA is provided in Appendix A. The final and complete deed restriction will be submitted to the Ohio EPA following completion of the last quarterly monitoring event, as shown in the closure schedule (Figure 6.2). The deed restriction for the HWSA will be developed based on the most recent Ohio EPA guidance.

6.8.4 Survey Plat

In accordance with OAC Rule 3745-66-16, a survey plat of the facility will be submitted to the Ohio EPA and the local zoning authority no later than the submission of the certification of closure. The plat will be prepared and certified by a professional land surveyor. The survey plat will contain a note, prominently displayed, that states the obligation of the owner/operator to restrict disturbance of the facility in accordance with OAC 3745-66-10 to 3745-66-20.

6.8.5 Closure Certification

Rickenbacker ANGB will submit certification of closure that states that closure of the facility was performed in accordance with the specifications in the approved closure plan. The certification will be submitted, by registered mail, to the Director of the Ohio EPA and to the Regional Administrator of the USEPA within 60 days of the completion of the established closure period. The certification will be signed by an agent of the owner/operator and by an independent, qualified, Ohio-registered professional engineer.

In accordance with Ohio Revised Code, OAC 3745-50-42(D), the signatories to the certification of closure will make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

6.9 CLOSURE CONTACT

The closure contact for the referenced site is:

Mr. Alan Friedstrom
AFBCA/DB
Rickenbacker IAP
7556 South Perimeter Road
Columbus, OH 43217-5910
Telephone: (614) 492-8065 Ext. 13

SECTION 7

REFERENCES

- Air Force Center for Environmental Excellence (AFCEE). 1996a. Technical Report: Decontamination of Building 560, Rickenbacker ANGB, OH. June. Final. Prepared for Human Systems Center/PKVBC.
- AFCEE. 1996b. Bioventing Performance and Cost Results from Multiple Air Force Test Sites, Technology Demonstration Final Technical Memorandum, Technology Transfer Division, Brooks AFB, Texas. June.
- Abdul, S.A., Gibson, T.L., and Rai, D.N., 1987, Statistical correlations for predicting the partition coefficient for nonpolar organic contaminants between aquifer organic carbon and water: *Hazardous Waste and Hazardous Materials*, vol. 4, no. 3, p. 211-222.
- Altenschmidt, U. and Fuchs, G., 1991, Anaerobic degradation of toluene in denitrifying *Pseudomonas* sp.: Indication for toluene methylhydroxylation and benzoyl-CoA as central aromatic intermediate: *Arch. Microbial.*, vol. 156, p. 152-158.
- Alvarez, P.J.J., and Vogel, T.M., 1991, Substrate interactions of benzene, toluene, and para-xylene during microbial degradation by pure cultures and mixed culture aquifer slurries: *Applied and Environmental Microbiology*, vol. 57, p. 2981-2985.
- Alvarez-Cohen, L.M. and McCarty, P.L., 1991a, Effects of toxicity, aeration, and reductant supply on trichloroethylene transformation by a mixed methanotrophic culture. *Appl. Environ. Microbiol.*, 57(1):228-235.
- Alvarez-Cohen, L.M. and McCarty, P.L., 1991b, Product toxicity and cometabolic competitive inhibition modeling of chloroform and trichloroethylene transformation by methanotrophic resting cells. *Appl. Environ. Microbiol.*, 57(4):1031-1037.
- Arciero, D., Vannelli, T., Logan, M., and Hooper, A.B., 1989, Degradation of trichloroethylene by the ammonia-oxidizing bacterium *Nitrosomonas europaea*. *Biochem. Biophys. Res. Commun.*, 159:640-643.
- Atlas, R.M., 1981, Microbial degradation of petroleum hydrocarbons - an environmental perspective: *Microbiological Reviews*, vol. 45, no. 1, p. 180-209.
- Atlas, R.M., 1984, *Petroleum Microbiology*: Macmillan Publishing Company, New York.

- Atlas, R.M., 1988, *Microbiology - Fundamentals and Applications*: Macmillan Publishing Company, New York.
- Baedecker, M.J., Siegel, D.I., Bennett, P.C., Cozzarelli, I.M., 1988, The fate and effects of crude oil in a shallow aquifer: I. The distribution of chemical species and geochemical facies, In: G.E. Mallard, and SE. Ragone, editors, U.S. Geological Survey Toxic Substances Hydrology Program, *Proceedings of the Technical Meeting*, Phoenix, Arizona, September 26-30, 1988: U.S. Geological Survey Water-Resources Investigations Report 88-42320, p. 29-22.
- Baedecker, M.J., and Cozzarelli, I.M., 1991, Geochemical modeling of organic degradation reactions in an Aquifer contaminated with Crude Oil: U.S. Geological Survey Water-Resources Investigations Report 91-4034. Reston, VA. p 627-632.
- Ball, H.A., Reinhard, M., and McCarty, P.L., 1991, Biotransformation of monoaromatic hydrocarbons under anoxic conditions, In: *In Situ Bioreclamation, Applications and Investigations for Hydrocarbon and Contaminated Site Remediation*. Eds. R.E. Hinchee and R.F. Olfenbuttel. Butterworth-Heinemann. Boston, MA. p. 458-463.
- Barker, J.F., Patrick, G.C., and Major, D., 1987, Natural attenuation of aromatic hydrocarbons in a shallow sand aquifer: *Ground Water Monitoring Review*, Winter 1987, p. 64-71.
- Bartha, R., 1986, Biotechnology of petroleum pollutant biodegradation: *Microbial Ecology*, vol. 12, p. 155-172.
- Bauman, B., 1991, Biodegradation research of the American Petroleum Institute. Presented at: *In Situ Bioreclamation: Application and Investigation for Hydrocarbons and Contaminated Site Remediation*. San Diego, CA. March 19-21, 1991.
- Beller, H.R., Reinhard, M., and Grbic-Galic, D., 1992, Metabolic byproducts of anaerobic toluene degradation by sulfate-reducing enrichment cultures: *Appl. Environ. Microbiol.*, vol. 58, p. 3192-3195.
- Borden, R.C., 1991, Simulation of enhanced in situ bioremediation of petroleum hydrocarbons. In: *In Situ Bioreclamation: Application and Investigation for Hydrocarbons and Contaminated Site Remediation*. Eds., R.E. Hinchee and R. F. Olfenbuttel. Butterworth-Heinemann. p. 529-534.
- Bouwer, E.J., 1992, Bioremediation of Subsurface Contaminants, In: Mitchell, R., ed.: *Environmental Microbiology*. Wiley-Liss, New York, New York.
- Bouwer, E.J., 1994, Bioremediation of chlorinated solvents using alternate electron acceptors: In: *Handbook of Bioremediation*. Lewis Publishers. Boca Raton, FL. 1994.
- Bouwer, E.J., Rittman, B.E., and McCarty, P.L., 1981, Anaerobic degradation of halogenated 1- and 2-carbon organic compounds. *Environ. Sci. Technol.*, 15(5):596-599.

- Bouwer, E.J. and Wright, J.P., 1988, Transformations of trace halogenated aliphatics in anoxic biofilm columns. *J. Contam. Hydrol.*, 2:155-169.
- Bradley, P.M. and Chapelle, F.H., 1996, Anaerobic mineralization of vinyl chloride in Fe(III)-reducing aquifer sediments. Accepted for publication in: *Environmental Science and Technology*.
- Brown, R.A., Dey, J.C. and McFarland, W.E., 1991, Integrated site remediation combining groundwater treatment, soil vapor extraction, and bioremediation, In: *In Situ Bioreclamation: Application and Investigation for Hydrocarbons and Contaminated Site Remediation*. Eds., R.E. Hinchee and R. F. Olfenbittel. Butterworth-Heinemann. p. 444-449.
- Butler, B.J., and Barker, J.F., 1996, Chemical and microbiological transformation and degradation of chlorinated solvent compounds, In, Pankow, J.F., and Cherry, J.A., eds., *Dense Chlorinated Solvents and Other DNAPLs in Groundwater: History, Behavior, and Remediation*. Waterloo Press, Waterloo, Ontario, p. 267-312.
- California Environmental Protection Agency. 1994. Preliminary Endangerment Assessment Guidance Manual. California Environmental Protection Agency, Department of Toxic Substances Control. January.
- Chapelle, F.H., 1993, *Ground-water Microbiology and Geochemistry*. John Wiley and Sons, Inc., New York, NY.
- Cozzarelli, I. M., Eganhouse, R.P., and Baedeker, M.J., 1990, Transformation of monoaromatic hydrocarbons to organic acids in anoxic groundwater environment: *Environ. Geol. Water Science*, 16.
- Chiang, C.Y., Salanitro, H.P., Chai, E.Y., Colthart, H.D., and Klein, C.L., 1989, Aerobic biodegradation of benzene, toluene, and xylene in a sandy aquifer - data analysis and computer modeling: *Ground Water*, vol. 27, no. 6, p. 823-834.
- Cline, P.V. and Delfino, J.J., 1989, Transformation kinetics of 1,1,1-trichloroethane to the stable product 1,1-dichloroethene. In: *Biohazards of Drinking Water Treatment*. Lewis Publishers, Inc, Chelsea, MI.
- Davis, J.W. and Carpenter, C.L., 1990, Aerobic biodegradation of vinyl chloride in groundwater samples. *Applied and Environmental Microbiology*, 56:3878.
- Davis, J.W., Klier, N.J., and Carpenter, 1994, Natural biological attenuation of benzene in ground water beneath a manufacturing facility: *Ground Water*, vol. 32, no. 2, p. 215-226.
- De Bruin, W.P., Kotterman, M.J.J., Posthumus, M.A., Schraa, G., and Zehnder, A.J.B., 1992, Complete biological reductive transformation of tetrachloroethene to ethane. *Applied and Environmental Microbiology*, 58(6):1966 - 2000.
- DeStefano, T.D., Gossett, J.M., and Zinder, S.H., 1991, Reductive dehalogenation of high concentrations of tetrachloroethene to ethene by an anaerobic enrichment culture in the absence of methanogenesis. *Appl. Environ. Microbiol.*, 57(8):2287-2292.

- Domenico, P.A., and Schwartz, F.W., 1990, Physical and Chemical Hydrogeology: John Wiley and Sons, New York, New York, 824 p.
- Engineering-Science, Inc. (ES). 1990, Field Investigation Report-Hazardous Waste Storage Area: Rickenbacker Air National Guard Base, Columbus, Ohio, October 1990.
- ES. 1992a, Pre-closure Sampling Report, Hazardous Waste Storage Area: Rickenbacker Air National Guard Base, Columbus, Ohio, March 1992.
- ES. 1992b, Addendum to the Pre-closure Sampling Report, Hazardous Waste Storage Area: Rickenbacker Air National Guard Base, Columbus, Ohio, January 1992.
- ES. 1993, Amended Closure/Post-Closure Plan, Hazardous Waste Storage Area, (Building 560): Rickenbacker Air National Guard Base, Columbus, Ohio, March 1993.
- Edwards, E.A., and Grbic-Galic, D., 1992, Complete mineralization of benzene by aquifer microorganisms under strictly anaerobic conditions: *Appl. Environ. Microbiol.*, vol. 58, p. 2663-2666.
- Edwards, E., Wills, L.E., Grbic-Galic, D., and Reinhard, M., 1991, Anaerobic degradation of toluene and xylene--evidence for sulfate as the terminal electron acceptor, In: In Situ Bioreclamation, Applications and Investigations for Hydrocarbon and Contaminated Site Remediation. Eds. R.E. Hinchee and R.F. Olfenbuttel. Butterworth-Heinemann. Boston, MA. p. 463-471.
- Edwards, E.A., Wells, L.E., Reinhard, M., and Grbic-Galic, D., 1992, Anaerobic degradation of toluene and xylene by aquifer microorganisms under sulfate-reducing conditions: *Applied and Environmental Microbiology*, v. 58, p. 794-800.
- Evans, P.J., Mang, D.T., and Young, L.Y., 1991a, Degradation of toluene and m-xylene and transformation of o-xylene by denitrifying enrichment cultures: *Applied and Environmental Microbiology*, v. 57, p. 450-454.
- Evans, P.J., Mang, D.T., Kim, K.S., and Young, L.Y., 1991b, Anaerobic degradation of toluene by a denitrifying bacterium: *Applied and Environmental Microbiology*, v. 57, p. 1139-1145.
- Folsom, B.R., Chapman, P.J., and Pritchard, P.H., 1990, Phenol and trichloroethylene degradation by *Pseudomonas cepacia* G4: Kinetics and interactions between substrates. *Appl. Environ. Microbiol.*, 56(5):1279-1285.
- Freedman, D.L. and Gossett, J.M., 1989, Biological reductive dehalogenation of tetrachloroethylene and trichloroethylene to ethylene under methanogenic conditions. *Appl. Environ. Microbiol.*, 55(4):1009-1014.
- Friedstrom, A. 1997. Personal Communication. AFBCA, Operating Location Rickenbacker, Columbus, Ohio. September.

- Gibson, D.T., and Subramanian, V., 1984, Microbial degradation of aromatic hydrocarbons, In: *Microbial Degradation of Organic Compounds*, Ed., D.T. Gibson, Marcel Dekker, Inc., p. 181-252.
- Godsy, E.M., 1994, Microbiological and geochemical degradation processes, In: *Symposium on Intrinsic Bioremediation in Ground Water*. Denver, CO. August 30 - September 1, 1994, p.35-40.
- Grbic-Galic, D., 1989, Microbial degradation of homocyclic and heterocyclic aromatic hydrocarbons under conditions: *Dev. Ind. Microbiol.*, vol. 30, p. 237-253.
- Grbic-Galic, D., 1990, Anaerobic microbial transformation of nonoxygenated aromatic and alicyclic compounds in soil, subsurface, and freshwater sediments, In: Bollag, J.M., and Stotzky, G., eds.: *Soil Biochemistry*: Marcel Dekker, Inc., New York, NY. p. 117-189.
- Haag, F., Reinhard, M., and McCarty, P.L., 1991, Degradation of toluene and p-xylene in an anaerobic microcosms: Evidence for sulfate as a terminal electron acceptor: *Environ. Toxicol. Chem.*, vol. 10, p. 1379-1389.
- Haines, R.P. 1997. Personal Communication. AFCEE Field Engineer, Rickenbacker ANGB, Ohio. September.
- Harker, A.R. and Kim, Y., 1990, Trichloroethylene degradation by two independent aromatic-degrading pathways in *Alcaligenes eutrophus* JMP134. *Appl. Environ. Microbiol.*, 56(4):1179-1181.
- Hartmans, S. and de Bont, J.A.M., 1992, Aerobic vinyl chloride metabolism in *Mycobacterium aurum* Li. *Appl. Environ. Microbiol.*, 58(4):1220-1226.
- Henry, S.M., 1991, *Transformation of trichloroethylene by methanotrophs from a groundwater aquifer*. Ph.D. Thesis, Stanford University. Palo Alto, California.
- Hinchee, R.E., S.K. Ong, R.N. Miller, D.C. Downey, and R. Frandt. 1992. Test Plan and Technical Protocol for a Field Treatability Test for Bioventing. January.
- Hutchins, S.R., and Wilson, J.T., 1991, Laboratory and field studies on BTEX biodegradation in a fuel-contaminated aquifer under denitrifying conditions, In: *In Situ Bioreclamation, Applications and Investigations for Hydrocarbon and Contaminated Site Remediation*. Eds. R.E. Hinchee and R.F. Olfenbuttel. Butterworth-Heinemann. Boston, MA. p. 157-172.
- Hutchins, S.R., Sewell, G.W., Sewell, D.A., Kovacs, D.A., and Smith, G.A., 1991a, Biodegradation of monoaromatic hydrocarbons by aquifer microorganisms using oxygen, nitrate, or nitrous oxide as the terminal electron acceptor: *Environ. Sci. Technol.*, vol. 25, no. 1, p. 68-76.
- Hutchins, S.R., Downs, W.C., Smith, G.B., Smith, J.T., Wilson, D.J., Hendrix, D.J., Fine, D.D., Kovacs, D.A., Douglass, R.H., and Blaha, F.A., 1991b, Nitrate for Bioremediation of an Aquifer Contaminated with Jet Fuel. U.S. Environmental Protection Agency. Robert S. Kerr Environmental Research Laboratory. Ada, Oklahoma. epa/600/2-91/009. April, 1991.

- International Technology Corporation (IT). 1995a. Draft Clay Layer Investigation, Rickenbacker Air National Guard Base, Ohio.
- IT. 1995b. Informal Technical Information Report, Groundwater Sampling, Site 1, Hazardous Waste Storage Area, Building 560, Rickenbacker ANGB, Ohio. Cincinnati, Ohio. 18 September.
- IT. 1996a. Draft Informal Technical Information Report (ITIR), Upper Water-Bearing Zone Investigation, Rickenbacker ANGB, Ohio. Cincinnati, Ohio. 21 February.
- IT. 1996b. Comparative Analysis of Nature and Extent of Groundwater Contamination, Site 1 - Hazardous Waste Storage Area. July.
- IT. 1997a. 1996 Annual Groundwater Monitoring Report, Rickenbacker ANGB, Ohio. Cincinnati, Ohio. 30 April.
- IT. 1997b. 1995 Annual Groundwater Monitoring Report, Rickenbacker ANGB, Ohio. Cincinnati, Ohio. 30 April.
- IT. 1997c. Soil and Groundwater Treatability Test Report, Site 1, Hazardous Waste Storage Area (Building 560), Rickenbacker ANGB, Ohio. Cincinnati, Ohio. February.
- IT. 1997d. Draft Remedial Investigation, Phase 2, Rickenbacker Air National Guard Base, Columbus, Ohio. Cincinnati, Ohio. January.
- IT. 1997e. Personal Communication with Karl Van Keuren. Cincinnati, Ohio.
- IT. 1998. Comments on the Draft Amended Closure Plan, Hazardous Waste Storage Area (Building 560), Rickenbacker Air National Guard Base, December 1997. Cincinnati, Ohio. 2 February.
- Jamison, V.W., Raymond, R.L., and Hudson, J.O. Jr., 1975, Biodegradation of high-octane gasoline in groundwater: Developments in Industrial Microbiology, v. 16.
- Klier, N.J., Welt, R.J., and Donberg, P.A., 1996, Aerobic biodegradation of dichlorethylenes in surface and subsurface soils. Submitted to *Chemosphere* by The Dow Chemical Company, Environmental Toxicology and Chemistry Laboratory, Health and Environmental Sciences. May.
- Kuehne, D., and Buscheck, T., 1996, Survey of California marketing sites and analysis of monitoring well data: Chevron Research and Technology, unpublished report.
- Larson, R.A., and Weber, E.J., 1994, Reaction Mechanisms in Environmental Organic Chemistry: Lewis Publishers, Boca Raton, Florida, 433p.
- Leahy, J.G., and Colwell, R.R., 1990, Microbial degradation of hydrocarbons in the environment: *Microbiological Reviews*, vol. 53, no. 3, p. 305-315.
- Lee, M.D., 1988, *Biorestitution of Aquifers Contaminated with Organic Compounds: CRC Critical Reviews in Environmental Control*. vol. 18. p. 29-89.

- Little, C.D., Palumbo, A.V., Herbes, S.E., Lidstrom, M.E., Tyndall, R.L., and Gilmer, P.J., 1988, Trichloroethylene biodegradation by a methane-oxidizing bacterium. *Appl. Environ. Microbiol.*, 54(4):951-956.
- Lovley, D.R., and Phillips, E.J.P., 1988, Novel mode of microbial energy metabolism: organic carbon oxidation coupled to dissimilatory reduction of iron or manganese. *Applied and Environmental Microbiology*, vol. 56, no. 6, p. 1472-1480.
- Lovley, D.R., Phillips, E.J.P., and Lonergan, D.J., 1991, Enzymatic versus nonenzymatic mechanisms for Fe(III) reduction in aquatic sediments. *Environmental Science and Technology*, vol. 26, no. 6, p. 1062-1067.
- Lyman, W.J., Reehl, W.F., and Rosenblatt, T.A., 1992, *Handbook of Chemical Property Estimation Methods Environmental Behavior of Organic Compounds*. McGraw-Hill, Inc., New York, NY.
- McCarthy, K.A., and Johnson, R.L., 1992, Transport of volatile organic compounds across the capillary fringe: *Water Resources Research*, v. 29, p. 1675-1683.
- McCarty, P.L., Roberts, P.V., Reinhard, M., and Hopkins, G., 1992, Movement and transformations of halogenated aliphatic compounds in natural systems. In: Schnoor, J.L. (Ed.), *Fate of Pesticides and Chemicals in the Environment*. John Wiley & Sons, Inc., New York, New York.
- McCarty, P.L. and Semprini, L., 1994, Ground-water treatment for chlorinated solvents. In: *Handbook of Bioremediation*. Lewis Publishers, Boca Raton, FL.
- Malone, D.R., Kao, C.M., and Borden, R.C., 1993, Dissolution and bioremediation of nonaqueous phase hydrocarbons - models development and laboratory evaluation: *Water Resources Research*, vol. 29, no. 7, p. 2003-2213.
- Masscheleyn, P.H., Delaune, R.D., Patrick, W.H., 1991a. *Heavy Metals in the Environment*: *Journal of Environmental Quality*, 20, p-522-527.
- Masscheleyn, P.H., Delaune, R.D., Patrick, W.H., 1991b, *Effect of Redox Potential and pH on Arsenic Speciation and Solubility in a Contaminated Soil*: *Environmental Science Technology*, Vol. 25, No. 8, p.1414-1419.
- Mayer, K.P., Grbic-Galic, D., Semprini, L., and McCarty, P.L., 1988, Degradation of trichloroethylene by methanotrophic bacteria in a laboratory column of saturated aquifer material. *Wat. Sci. Tech.* (Great Britain), 20(11/12):175-178.
- Micromedex, Inc. 1997. Toxicological, Occupational Medicine, and Environmental Series (TOMES) plus Database. Vol. 33. Denver, Colorado.
- Miller, R.E. and Guengerich, F.P., 1982, Oxidation of trichloroethylene by liver microsomal cytochrome P-450: Evidence for chlorine migration in a transition state not involving trichloroethylene oxide. *Biochemistry*, 21:1090-1097.
- Murray, W.D. and Richardson, M., 1993, Progress toward the biological treatment of C₁ and C₂ halogenated hydrocarbons. *Critical Reviews in Environmental Science and Technology*, 23(3):195-217.

- Nelson, M.J.K., Montgomery, S.O., O'Neill, E.J., and Pritchard, P.H., 1986, Aerobic metabolism of trichloroethylene by a bacterial isolate. *Appl. Environ. Microbiol.*, 52(2):949-954.
- Ogden Environmental and Energy Services, Inc. (Ogden). 1995a. Closure Report, Underground Storage Tank Closure Project, Building 560-HWSA (Group 3A), Rickenbacker Air National Guard Base, Columbus, Ohio. Blue Bell, Pennsylvania. 11 August.
- Ogden. 1995b. Final Report, Underground Storage Tank Closure Project, Rickenbacker Air National Guard Base, Columbus, Ohio. Blue Bell, Pennsylvania. 28 September.
- Ohio Environmental Protection Agency (Ohio EPA). 1993a. Closure Plan Review Guidance for RCRA Facilities. Division of Hazardous Waste Management. September.
- Ohio EPA. 1993b. Guidance for Reviewing Risk-Based Closure Plans for RCRA Units. Division of Hazardous Waste Management. September.
- Ohio EPA. 1995a. Comprehensive Groundwater Monitoring Evaluation. Rickenbacker Air National Guard Base. June.
- Ohio EPA. 1995b. Memorandum to Voluntary Action Program Steering Committee, from Donald R. Schrogardus, Director, regarding Generic Standard Risk Goal. November 13.
- Ohio EPA. 1997. Facsimile from Stephanie McClure, Ohio EPA/DHWM, regarding adoption of the generic risk goal of 10^{-5} by Ohio EPA based on the November, 13, 1995 Voluntary Action Program Steering Committee Memorandum. April 3.
- Parsons Engineering Science, Inc. (Parsons ES). 1995a. Draft Amended Closure/Post-Closure Plan, Hazardous Waste Storage Area (Building 560), Rickenbacker ANGB, Columbus, Ohio. Denver, Colorado. October.
- Parsons ES. 1995b. Draft Work Plan for a Treatability Study in Support of the Intrinsic Remedation (Natural Attenuation) Option at Site 1 (Hazardous Waste Storage Area), Rickenbacker Air National Guard Base, Columbus, Ohio. Denver, Colorado. February.
- Parsons ES. 1996. Revised Draft Amended Closure/Post-Closure Plan, Hazardous Waste Storage Area (Building 560), Rickenbacker ANGB, Columbus, Ohio. Denver, Colorado. October.
- Parsons ES. 1997a. Draft Final Amended Closure/Post Closure Plan, Hazardous Waste Storage Area (Building 560), Rickenbacker Air National Guard Base, Columbus, Ohio. Denver, Colorado. February.
- Parsons ES. 1997b. Work Plan for Additional Assessment Activities, Hazardous Waste Storage Area (Building 560). Rickenbacker Air National Guard Base. Columbus, Ohio. Denver, Colorado. June.

- Pierce, L.J., 1959, The Climate of Ohio; in *Climates of the States, Volume 1 - Eastern States*; Water Information Center, Inc., 1974, pp. 300-317.
- Reinhard, M., Goodman, N.L., and Barker, J.F., 1984, Occurrence and distribution of organic chemicals in two landfill leachate plumes: *Environ. Sci. Technol.*, vol. 18, no. 12, p. 953-961.
- Rice, D.W., R.D. Grose, J.C. Michaelson, B.P. Doohar, D.H. MacQueen, S.J. Cullen, W.E. Kastenberg, L.G. Everett, and M.A. Marino, 1995, California Leaking Underground Fuel Tank (LUFT) Historical Case Analyses: California State Water Resources Control Board.
- Rivett, M.O., 1995, Soil-gas signatures from volatile chlorinated solvents: Borden Field Experiments: *Ground Water*, v. 33, no. 1, p. 84-98.
- Schmidt, J.J., and Goldthwait, R.P., 1958, The Ground-Water Resources of Franklin County, Ohio: Bulletin 30, Ohio Department of Natural Resources, Division of Water, 1958.
- Soil Conservation Service, 1976, Soil Survey of Franklin County, Ohio; USDA, Soil Conservation Service, 188 p. and 69 sheets.
- Stumm, W. and Morgan, J.J., 1981, *Aquatic Chemistry*. John Wiley & Sons, New York, NY.
- Thierrin, J., Davis, G.B., Barber, C., Patterson, B.M., Pribac, F., Power, T.R., and Lambert, M., 1992, Natural degradation rates of BTEX compounds and naphthalene in a sulfate reducing ground water environment, In: *In-Situ Bioremediation Symposium "92"*. Niagara-on-the-Lake, Ontario, Canada. September 20-24, 1992: In Press.
- US Environmental Protection Agency (USEPA), 1986, Test Methods for Evaluating Solid Wastes, SW-846, November, 1986.
- USEPA. 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final, Publication EPA 540/1-89/002.
- USEPA. 1991a. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim Publication 9285.7-01B.
- USEPA. 1991b. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives), Interim Final, Publication 9285.7-01C.
- USEPA. 1991c. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors." Office of Solid Waste and Emergency Response Directive 9285.6-03.
- USEPA. 1992a. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER Directive 9285.7-081. May.

- USEPA. 1992b. Guidelines for Exposure Assessment. Notice, Federal Register, Vol 57, No. 104 (Friday, May 29, 1992).
- USEPA. 1992c. Guidance on Risk Characterization for Risk Managers and Risk Assessors. February.
- USEPA. 1992d. Guidance for Data Usability in Risk Assessment (Part A, Final) April.
- USEPA. 1992e. Dermal Exposure Assessment: Principles and Applications. EPA/600/8-91/011B. Interim Report. January.
- USEPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/R-93/089. July.
- USEPA. 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.
- USEPA Region 8. 1994. Health Risk Assessments for Superfund Sites: Fact Sheet. Region 8 Technical Guidance.
- USEPA. 1995. Health Effects Assessment Summary Tables. FY-1995 Annual. EPA/540/R-95/036. May.
- USEPA. 1996a. Drinking Water Regulations and Health Advisories, Office of Water. Washington D.C. October 1996.
- USEPA. 1996b. Proposed Guidelines for Ecological Risk Assessment. Cincinnati, OH: Office of Research and Development Publications, Technology Transfer and Support Division, EPA/630/R-95/002B. August
- USEPA. 1996c. Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128. Office of Solid Waste and Emergency Response.
- US Geological Survey (USGS). 1985. Lockbourne Quadrangle, Ohio. Denver, Colorado.
- Vogel, T.M. 1994, Natural bioremediation of chlorinated solvents. In: *Handbook of Bioremediation*. Lewis Publishers, Boca Raton, FL.
- Vogel, T.M., Criddle, C.S., and McCarty, P. L. 1987, Transformations of halogenated aliphatic compounds. *Environmental Science and Technology*, 21(8):722-736.
- Vogel, T.M. and McCarty, P.L., 1985, Biotransformation of tetrachloroethylene to trichloroethylene, dichloroethylene, vinyl chloride, and carbon dioxide under methanogenic conditions. *Applied Environmental Microbiology*, 49(5):1080-1083.
- Vroblesky, D.A., and Chapelle, F.H., 1994, Temporal and spatial changes of terminal electron-accepting processes in a petroleum hydrocarbon-contaminated aquifer and the significance for contaminant biodegradation: *Water Resources Research*, v. 30, no. 5, p. 1561-1570.

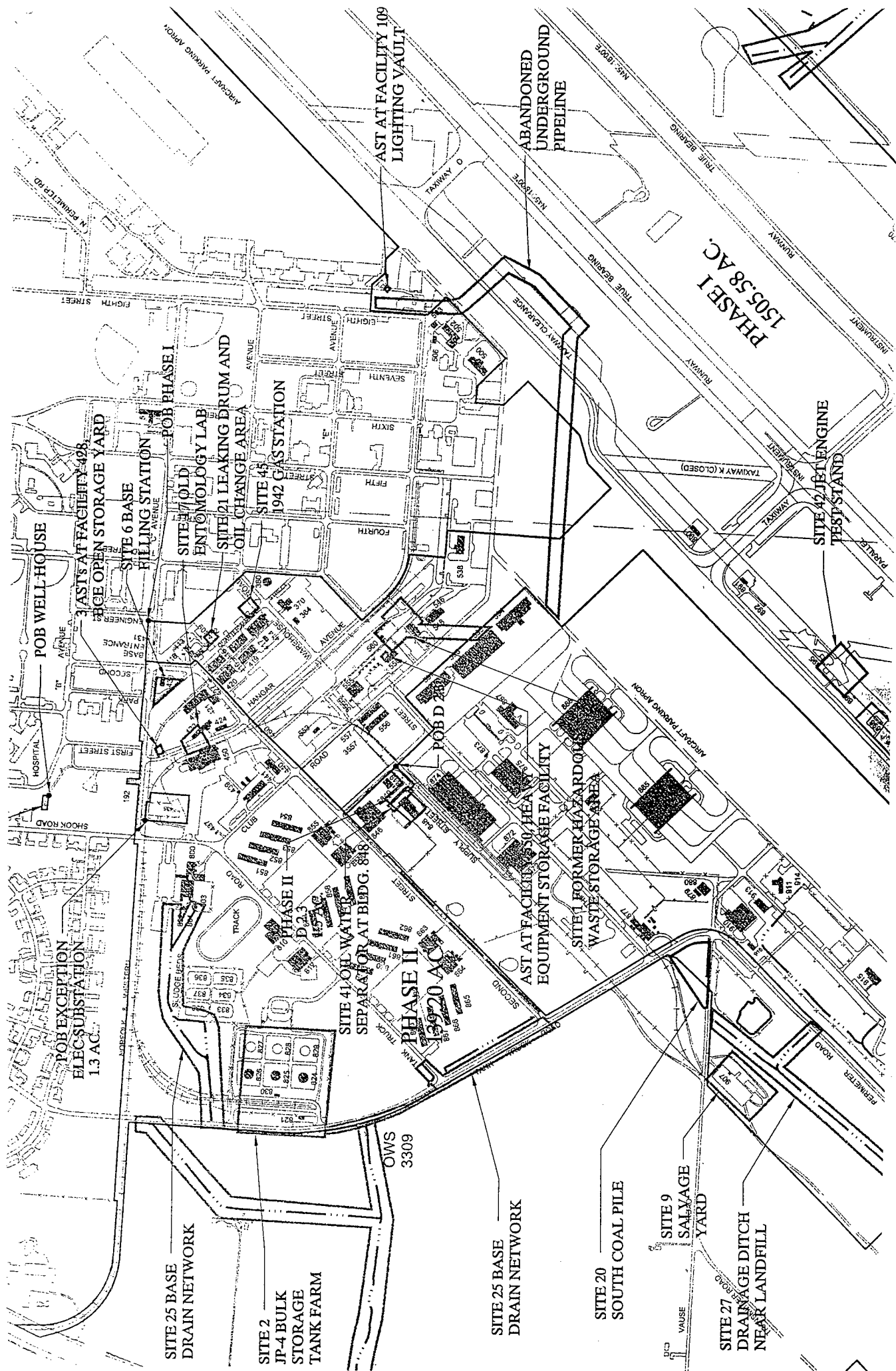
- Wiedemeier, T.H., Wilson, J.T., Kampbell, D.H., Miller, R.N., and Hansen, J.E., 1995, Technical protocol for implementing intrinsic remediation with long-term monitoring for natural attenuation of fuel contamination dissolved in groundwater: US Air Force Center for Environmental Excellence, San Antonio, Texas.
- Wilson, J.T. and Wilson, B.H., 1985, Biotransformation of trichloroethylene in soil. *Appl. Environ. Microbiol.*, 49(1):242-243.
- Wilson, B. H., Smith, G.B., and Rees, J.F., 1986, Biotransformations of selected alkylbenzenes and halogenated aliphatic hydrocarbons in methanogenic aquifer material - A microcosm study: *Environmental Science and Technology*, v. 20, p. 997-1002.
- Wilson, B.H., Bledsoe, B., and Kampbell, D., 1987, Biological processes occurring at an aviation gasoline spill site, In R. C. Averett and D. M. Mcknight editors, *Chemical Quality of Water and the Hydrologic Cycle*: Lewis Publishers, Chelsea, Michigan, p. 125-137.
- Wilson, B.H., Wilson, J.T., Kampbell, D.H., Bledsoe, B.E., and Armstrong, J.M., 1990, Biotransformation of Monoaromatic and Chlorinated Hydrocarbons at an Aviation Gasoline Spill Site: *Geomicrobiology Journal*, 8:225-240.
- Young, L.Y., 1984, Anaerobic degradation of aromatic compounds, In: Gibson, D.R., ed.: *Microbial Degradation of Aromatic Compounds*. Marcel-Dekker, New York.

APPENDIX A

AVAILABLE FUTURE LAND USE DOCUMENTATION

APPENDIX A-1

**HWSA LOCATION WITHIN PHASE I (PARCEL D1) OF RPA
DEVELOPMENT PLAN**



APPENDIX A-2

**EXAMPLE DEED RESTRICTION LANGUAGE FROM AIR FORCE
PLANT 85 (JAMES ROAD), COLUMBUS, OHIO**

JAMES ROAD ENVIRONMENTAL RESTRICTION.

The Grantor, United States Air Force hereby provides public notice about, and imposes restrictions on, the following described real estate commonly known as the James Road parcel which is a sub parcel of the Property, which sub parcel shall hereinafter be referred to as the "Area", more particularly described as follows:

Situated in the State of Ohio, County of Franklin, City of Columbus, in Quarter Township 4, Township 1, Range 17, United States Military Lands and being part of the 62.068 acre tract conveyed to The United States of America by deed of record in Deed Book 1733, page 399, Records Office, Franklin County, Ohio, and being more particularly described as follows:

Beginning for reference at a found railroad spike in the centerline of James Road at an inside corner of said 62.068 acre tract, at the northeast corner of a 2.353 acre tract conveyed to Modern Builders Supply, Incorporated, by deed of record in Official Record 21382, Page B11, Records Office, Franklin County, Ohio; thence across said 62.068 acre tract on a projection of the centerline of said James Road, North $53^{\circ}12'32''$ East, a distance of 322.37 feet to the TRUE POINT OF BEGINNING in the westerly line of the herein described tract of land; thence with said westerly line.

North $34^{\circ}11'05''$ West, a distance of 74.70 feet to a set iron pin; thence

North $55^{\circ}48'55''$ East, a distance of 230.13 feet to a set iron pin; thence

South $34^{\circ}11'05''$ East, a distance of 110.00 feet to a set iron pin about 10 feet southeast of the southeast edge of the old James Road pavement; thence with a line generally parallel to said edge of pavement and about 10 feet distant therefrom,

South $55^{\circ}48'55''$ West, a distance of 230.13 feet to a set iron pin; thence North $34^{\circ}11'05''$ West, a distance of 35.30 feet to the TRUE POINT OF BEGINNING, passing said edge of pavement at about 10 feet, containing 0.581 acre of land.

1. In consideration for the Director of the Ohio EPA's approval of the Hazardous Waste Closure Plan dated 9/29/97, 1997 for the Area, Grantor agreed to impose the restrictions described below on the Area.

2. The Grantor hereby imposes the following restrictions on the Area:

The Area shall not be used for residential activities, but may be used for industrial activities. The term "residential activities" shall include the following:

- (1) Single and multi-family dwelling and rental units;

- (2) Day care centers and preschools;
- (3) Hotels and motels;
- (4) Educational (except as a part of the facility's industrial activities) and religious facilities;
- (5) Restaurants and other food and beverage services (except as a part of the facility's industrial activities);
- (6) Entertainment and recreational facilities (except as a part of the facility's industrial activities);
- (7) Hospitals and other extended care medical facilities; and
- (8) Transient or other residential facilities.

The term "industrial activities" shall include manufacturing, processing operations and office and warehouse use, including but not limited to production, storage and sales of durable goods and other non-foodchain products and parking/driveway use.

3. All of the above restrictions on the Area shall run with the land and be binding upon the Grantor, its successors, assigns, transferees, or any other owner of the Facility. All of the above restrictions shall continue in perpetuity, subject to termination as described below.

4. Any person may request written approval for a use of the Area which is not specifically permitted by the restriction set forth above in paragraph 3 by submitting a written petition, via certified mail, to the Director of Ohio EPA. The Director shall respond to such request within sixty (60) days of receipt of such written request. Any such request which constitutes a change in the specific prohibition may only be granted based on the standards described below. In such event, the petition for modification or termination shall state the specific provision(s) sought to be modified or terminated and shall further include evidence demonstrating:

(a) The Area meets Ohio's risk-based closure performance standard in effect at the time of such petition for a residential (or equivalent) land-use scenario; or

(b) The Area has been sample tested and compared with background samples taken from land surrounding the Area which has been unaffected by past treatment, storage, or disposal of hazardous waste, and such data shows that current conditions present at the Area are not statistically greater than background conditions; or

(c) The Area does not pose an unacceptable risk to human health or the environment.

5. The petition will be considered by the Director of Ohio EPA only when it presents new and relevant information not previously considered by the Agency. The Director of Ohio EPA will issue a final determination within such sixty (60) day period based upon the criteria set forth above.

6. For violation or breach of the foregoing Use Restriction, Ohio EPA shall have the right to proceed at law or in equity to compel compliance with the terms hereof or to obtain injunctive relief in order to prevent violation or breach of the foregoing Use Restriction. Failure to timely enforce the foregoing covenant and Use Restriction by any party shall not bar subsequent enforcement by such party and shall in no manner be deemed a waiver.

APPENDIX B

PREVIOUS SITE ANALYTICAL DATA (1988-1996)

APPENDIX B-1

SUMMARY OF ANALYTICAL DATA, 1988-1990

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #		GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Anthraceno		130	J	ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthone		1500		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene		1500		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthraceno		740		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysone		770		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthone		750		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthone		530		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene		650		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene		440		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene		300		ug/kg	330
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	UNJ	4.6		mg/kg	6
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	BNJ	9.6		mg/kg	1
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	B	0.45		mg/kg	0.5
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium		0.60		mg/kg	0.5
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	NJ	14.4		mg/kg	1
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	*	15.0		mg/kg	2.5
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead		110		mg/kg	0.3
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	B	0.099		mg/kg	0.1
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel		14.1		mg/kg	4
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	U	0.2		mg/kg	0.5
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	U	0.75		mg/kg	1
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	UNWJ	0.53		mg/kg	1
SU-19		A-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	NJ	90.0		mg/kg	2
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	ALL SEMI-VOLATILES		ND	NA	ug/kg	NA
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony		4	UNJ	mg/kg	6
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic		13.1	BNJ	mg/kg	1
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium		1.0	NJ	mg/kg	0.5
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium		0.19	U	mg/kg	0.5
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium		9.1	NJ	mg/kg	1
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper		15.3	*	mg/kg	2.5
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead		22.9		mg/kg	0.3
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury		0.082	BU	mg/kg	0.1
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel		15.2		mg/kg	4
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium		0.2	BW	mg/kg	0.5
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver		0.66	U	mg/kg	1
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium		0.47	UNWJ	mg/kg	1
SU-20		A-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc		71	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS			DETECTION		
						ALL SEMI-VOLATILES	RESULTS	QUALIFIER	UNITS	UNIT	
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Antimony	ND	NA	ug/kg	NA	6
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	4.8	UNJ	mg/kg	mg/kg	1
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.36	B	mg/kg	mg/kg	0.5
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.24	B	mg/kg	mg/kg	0.5
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	3.8	NU	mg/kg	mg/kg	1
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	11	.	mg/kg	mg/kg	2.5
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	25.7		mg/kg	mg/kg	0.3
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.06	U	mg/kg	mg/kg	0.1
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	11.9		mg/kg	mg/kg	4
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.23	BW	mg/kg	mg/kg	0.5
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.78	U	mg/kg	mg/kg	1
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.53	UNWJ	mg/kg	mg/kg	1
SU-21	A-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	34.4	NU	mg/kg	mg/kg	2
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	290	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	600		ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	570		ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	200	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	320	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	350	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	250	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	100	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	160	J	ug/kg	ug/kg	330
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.0	UNJ	mg/kg	mg/kg	6
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	6.4	BNJ	mg/kg	mg/kg	1
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.8		mg/kg	mg/kg	0.5
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.24	B	mg/kg	mg/kg	0.5
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	8.8	NU	mg/kg	mg/kg	1
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	12.8	.	mg/kg	mg/kg	2.5
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	43.8		mg/kg	mg/kg	0.3
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.053	U	mg/kg	mg/kg	0.1
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	12.2		mg/kg	mg/kg	4
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.21	UW	mg/kg	mg/kg	0.5
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.79	U	mg/kg	mg/kg	1
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.54	UNWJ	mg/kg	mg/kg	1
SU-22	A-5	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	60.4	NU	mg/kg	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS					DETECTION					
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	FOR	RESULTS	QUALIFIER	UNITS	UNIT
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	200	J	ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	590		ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	570	J	ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	260	J	ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	290	J	ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	520		ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	260	J	ug/kg	330
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.0	UNJ	mg/kg	6
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	10.0	BNJ	mg/kg	1
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.96		mg/kg	0.5
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.23	U	mg/kg	0.5
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	14.7	NJ	mg/kg	1
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	10.6	*	mg/kg	2.5
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	52.9		mg/kg	0.3
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.09	B	mg/kg	0.1
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	21.4	U	mg/kg	4
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.2	U	mg/kg	0.5
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.79	U	mg/kg	1
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.54	UNWJ	mg/kg	1
SU-23	A-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	106	NJ	mg/kg	2
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	140	J	ug/kg	330
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	150	J	ug/kg	330
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.5	UNJ	mg/kg	6
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	15.2	NJ	mg/kg	1
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.67		mg/kg	0.5
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.22	B	mg/kg	0.5
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	14.1	NJ	mg/kg	1
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	17.0	*	mg/kg	2.5
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	60.4		mg/kg	0.3
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.056	U	mg/kg	0.1
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	24.1		mg/kg	4
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.10	UW	mg/kg	0.5
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.74	U	mg/kg	1
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.46	UNWJ	mg/kg	1
SU-24	A-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	95.7	NJ	mg/kg	2

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS FOR						RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY					
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	150	J	ug/kg	330
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	150	J	ug/kg	330
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	3.0	UNJ	mg/kg	6
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	17.3		mg/kg	0.5
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.60		mg/kg	0.5
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.47		mg/kg	1
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	14.5		mg/kg	2.5
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	23.3	NJ	mg/kg	0.3
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	22.4	N*J	mg/kg	0.1
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	0.059	U	mg/kg	4
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	24.4		mg/kg	0.5
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	0.31	BW	mg/kg	1
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	0.62	U	mg/kg	1
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	0.21	BNWJ	mg/kg	2
SU-25	B-2	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	0.4	NJ	mg/kg	2
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene	550		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	1100		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	1100		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	520		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene	560		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	1000		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	510		ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	330	J	ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	330	J	ug/kg	330
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	4.9	UNJ	mg/kg	6
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	12.5	NJ	mg/kg	0.5
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.49	B	mg/kg	0.5
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	1.4		mg/kg	1
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	18.6	N	mg/kg	1
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	31.6	*	mg/kg	2.5
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	90.7		mg/kg	0.3
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	2.6	U	mg/kg	0.1
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	20.2		mg/kg	4
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	0.74	BW	mg/kg	0.5
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	7.2	U	mg/kg	1
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	0.56	UNWJ	mg/kg	1
SU-26	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	203	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						ALL SEMI - VOLATILES	SV				NA	UNJ
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Antimony	M	ND	NA	ug/kg	NA	6
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	M	4.3	UNJ	mg/kg	6	0.5
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	M	14	NJ	mg/kg	0.5	0.5
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	M	0.65	U	mg/kg	1	1
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	M	0.2	N	mg/kg	1	1
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	M	14.1	•	mg/kg	2.5	2.5
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	M	20.2	U	mg/kg	0.3	0.3
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	M	59.0	U	mg/kg	0.1	0.1
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	M	0.052	U	mg/kg	4	4
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	M	23.5	B	mg/kg	0.5	0.5
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	M	0.26	U	mg/kg	1	1
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	M	0.71	UNWJ	mg/kg	1	1
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	M	0.40	NJ	mg/kg	2	2
SU-27	B-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	M	89.3	NJ	mg/kg	2	2
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	SV	ALL SEMI - VOLATILES	SV	ND	NA	ug/kg	NA	6
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	M	4.0	UNJ	mg/kg	6	0.5
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	M	10.0	BNJ	mg/kg	0.5	0.5
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	M	0.60	U	mg/kg	1	1
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	M	0.22	U	mg/kg	1	1
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	M	13.0	N	mg/kg	2.5	2.5
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	M	17.4	•	mg/kg	0.3	0.3
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	M	43.2	U	mg/kg	0.1	0.1
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	M	0.064	U	mg/kg	4	4
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	M	10.0	B	mg/kg	0.5	0.5
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	M	0.40	U	mg/kg	1	1
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	M	0.75	UNWJ	mg/kg	1	1
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	M	0.50	UNWJ	mg/kg	1	1
SU-20	B-5	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	M	95	NJ	mg/kg	2	2

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						Pyrene	Fluoranthene				
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV			260	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV			220	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene		140	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene		160	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		160	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene		130	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene		140	J	ug/kg	330
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony		4.7	UNJ	mg/kg	6
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic		11.9	NJ	mg/kg	0.5
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium		0.93		mg/kg	0.5
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium		0.22	U	mg/kg	1
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium		11.1	N	mg/kg	1
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Copper		20.0	*	mg/kg	2.5
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Lead		32.1		mg/kg	0.3
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury		0.050	U	mg/kg	0.1
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel		21.5		mg/kg	4
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium		0.34	BW	mg/kg	0.5
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Silver		0.77	U	mg/kg	1
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium		0.49	UNW	mg/kg	1
SU-29	B-6	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc		109	N	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	170	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	210	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	130	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	140	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	220	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	190	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	230	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	200	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	220	J	ug/kg	330
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.9	UNJ	mg/kg	6
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	0.6	BNJ	mg/kg	0.5
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.49	B	mg/kg	0.5
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.23	U	mg/kg	1
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	14.4	NJ	mg/kg	1
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	14	*	mg/kg	2.5
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	65.1	U	mg/kg	0.3
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.052	U	mg/kg	0.1
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	13.9	*	mg/kg	4
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.36	BW	mg/kg	0.5
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.01	U	mg/kg	1
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.54	UNJW	mg/kg	1
SU-30	B-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	76.3	NJ	mg/kg	2
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	5.3	UNJ	mg/kg	6
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	6.9	BNWJ	mg/kg	0.5
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.66		mg/kg	0.5
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.53	B	mg/kg	1
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	12.8	NJ	mg/kg	1
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	13	*	mg/kg	2.5
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	40.0		mg/kg	0.3
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.004	U	mg/kg	0.1
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	16	B	mg/kg	4
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.59		mg/kg	0.5
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.07	U	mg/kg	1
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.50	UNJW	mg/kg	1
SU-31	C-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	59	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS		RESULTS	QUALIFIER	UNITS	DETECTION UNIT
						FOR	SV				
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	ALL SEMI-VOLATILES	SV	ND	NA	ug/kg	NA
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	M	4.9	UNJ	mg/kg	6
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	M	10.1	NJ	mg/kg	0.5
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	M	0.73		mg/kg	0.5
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	M	0.49	D	mg/kg	1
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	M	16.2	NJ	mg/kg	1
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	M	22.6	*	mg/kg	2.5
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	M	41.6		mg/kg	0.3
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	M	0.001	U	mg/kg	0.1
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	M	27.3		mg/kg	4
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	M	0.10	UW	mg/kg	0.5
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	M	0.01	U	mg/kg	1
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	M	0.40	UNJW	mg/kg	1
SU-32	C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	M	113	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						ANALYSIS	FOR				UNITS	LIMIT
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene		920	J	ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Anthracene		100		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene		1900		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene		2300		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene		1400		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene		1400		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		1400		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene		1200		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene		1300		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene		800		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Dibenz(a,h)Anthracene		240	J	ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene		500		ug/kg		330
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony		5	UNJ	mg/kg		6
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic		20		mg/kg		0.5
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium		0.75		mg/kg		0.5
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium		0.83		mg/kg		1
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium		13.2		mg/kg		1
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Copper		25.5	NJ	mg/kg		2.5
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Lead		112	N*J	mg/kg		0.3
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury		0.064	U	mg/kg		0.1
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel		24.5		mg/kg		4
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium		0.49	BW	mg/kg		0.5
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Silver		0.03	U	mg/kg		1
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium		0.19	BNWJ	mg/kg		1
SU-33	C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc		124	NJ	mg/kg		2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						ALL SEMI-VOLATILES						
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Antimony	ND	NA	NA	ug/kg	NA	6
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	4.3	UNJ	UNJ	mg/kg	6	0.5
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	15.0	U	U	mg/kg	0.5	0.5
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.53	U	U	mg/kg	1	1
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	0.2	U	U	mg/kg	1	1
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	11.5	U	U	mg/kg	2.5	2.5
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	20.8	U	U	mg/kg	0.3	0.3
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	19.5	U	U	mg/kg	0.1	0.1
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	0.057	U	U	mg/kg	4	4
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	24.0	BW	BW	mg/kg	0.5	0.5
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	0.39	U	U	mg/kg	1	1
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	0.7	UNWJ	UNWJ	mg/kg	1	1
SU-34	C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	0.52	U	U	mg/kg	2	2
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene	230	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	420	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	340	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	180	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene	210	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	250	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	200	J	J	ug/kg	330	330
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	4.5	UNJ	UNJ	mg/kg	6	6
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	7.9	BNWJ	BNWJ	mg/kg	0.5	0.5
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.79	U	U	mg/kg	0.5	0.5
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.23	B	B	mg/kg	1	1
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	14.3	U	U	mg/kg	2.5	2.5
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	17	U	U	mg/kg	0.3	0.3
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	27.1	U	U	mg/kg	0.1	0.1
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	0.062	U	U	mg/kg	4	4
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	19.7	U	U	mg/kg	0.5	0.5
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	0.2	U	U	mg/kg	1	1
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	0.74	U	U	mg/kg	1	1
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	0.54	UNWJ	UNWJ	mg/kg	1	1
SU-35	C-6	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	93.9	U	U	mg/kg	2	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS -- SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			DETECTION LIMIT		
						SV	ALL SEMI-VOLATILES	RESULTS	QUALIFIER	UNITS	LIMIT
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Antimony	4.1	UNJ	mg/kg	6
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Arsenic	9.9	B	mg/kg	0.5
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Beryllium	0.41	B	mg/kg	0.5
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Cadmium	0.31	B*	mg/kg	1
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Chromium	8.7		mg/kg	1
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Copper	15	*	mg/kg	2.5
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Lead	24.8	*	mg/kg	0.3
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Mercury	0.042	U	mg/kg	0.1
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Nickel	17.9	*	mg/kg	4
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Selenium	0.25	BW	mg/kg	0.5
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Silver	0.60	U	mg/kg	1
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Thallium	0.47	UNWJ	mg/kg	1
SU-36	C-7	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Zinc	60.2	N*J	mg/kg	2
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Antimony	4.2	UNJ	mg/kg	6
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Arsenic	17.6		mg/kg	0.5
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Beryllium	0.74		mg/kg	0.5
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Cadmium	0.2	U*	mg/kg	1
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Chromium	15.7		mg/kg	1
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Copper	21.9	*	mg/kg	2.5
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Lead	28.7	*	mg/kg	0.3
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Mercury	0.066	U	mg/kg	0.1
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Nickel	20.6	*	mg/kg	4
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Selenium	0.25	BW	mg/kg	0.5
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Silver	0.7	U	mg/kg	1
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Thallium	0.54	UNWJ	mg/kg	1
SU-37	C-8	0-2	OUT	SURFACE SOIL SAMPLE	M	M	Zinc	95.1	N*J	mg/kg	2

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION UNIT
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Aconaphthene	170	J	ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluorene	150	J	ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	2000		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Anthracene	300	J	ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	2300		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	2100		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	810		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	860		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	790		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	590		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	840		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	560		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	490		ug/kg	330
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.9	UNJ	mg/kg	6
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	13.8		mg/kg	0.5
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.62		mg/kg	0.5
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.37	B*	mg/kg	1
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	13.7		mg/kg	1
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	22.9	*	mg/kg	2.5
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	37.4	*	mg/kg	0.3
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.062	U	mg/kg	0.1
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	23.3	*	mg/kg	4
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.32	BW	mg/kg	0.5
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.81	U	mg/kg	1
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.55	UNWJ	mg/kg	1
SU-30	D-1	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	91.9	N*J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS					DETECTION					
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	FOR	RESULTS	QUALIFIER	UNITS	LIMIT
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	150	J	ug/kg	330
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Anthimony	5.1	UNJ	mg/kg	6
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	12.1	B	mg/kg	0.5
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.03		mg/kg	0.5
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.30	B*	mg/kg	1
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	22.0		mg/kg	1
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	30.8	*	mg/kg	2.5
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	73.4	*	mg/kg	0.3
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	0.050	U	mg/kg	0.1
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	26.4	*	mg/kg	4
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	0.29	BW	mg/kg	0.5
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	0.03	U	mg/kg	1
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	0.66	BNWJ	mg/kg	1
SU-39	D-2	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	196	N*J	mg/kg	2
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene	130	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	300	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	340	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene	310	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	300	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	170	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	150	J	ug/kg	330
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Anthimony	5.2	UNJ	mg/kg	6
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	19.8		mg/kg	0.5
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.78		mg/kg	0.5
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.39	B*	mg/kg	1
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	22.7		mg/kg	1
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	36.1	*	mg/kg	2.5
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	44.3	*	mg/kg	0.3
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	0.074	B	mg/kg	0.1
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	30.5	*	mg/kg	4
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	0.32	BW	mg/kg	0.5
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	0.00	U	mg/kg	1
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	0.95	BNWJ	mg/kg	1
SU-40	D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	139	N*J	mg/kg	2

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ANALYSIS	FOR				
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene		330	J	ug/kg	330
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene		300	J	ug/kg	330
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene		200	J	ug/kg	330
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		240	J	ug/kg	330
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene		170	J	ug/kg	330
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony		5.1	UNJ	mg/kg	6
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic		17.0		mg/kg	0.5
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium		0.30	B	mg/kg	0.5
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium		0.24	U*	mg/kg	1
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium		12.0		mg/kg	1
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Copper		25.0	*	mg/kg	2.5
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Lead		39.2	*	mg/kg	0.3
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury		0.061	U	mg/kg	0.1
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel		21.5	*	mg/kg	4
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium		0.22	U	mg/kg	0.5
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Silver		0.03	U	mg/kg	1
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium		0.6	BNWJ	mg/kg	1
SU-41	D-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc		87.9	N*J	mg/kg	2
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene		160	J	ug/kg	330
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene		190	J	ug/kg	330
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony		5.3	UNJ	mg/kg	6
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic		16.7		mg/kg	0.5
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium		0.53	B	mg/kg	0.5
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium		0.26	D*	mg/kg	1
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium		16		mg/kg	1
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Copper		32.6	*	mg/kg	2.5
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Lead		35	*	mg/kg	0.3
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury		0.067	U	mg/kg	0.1
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel		30.9	*	mg/kg	4
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium		0.30	B	mg/kg	0.5
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Silver		0.07	U	mg/kg	1
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium		0.61	UNWJ	mg/kg	1
SU-42	D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc		109	N*J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	DETECTION	
						ALL SEMI-VOLATILES	SV			UNITS	UNIT
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	M	ND	NA	ug/kg	NA
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	M	4.7	UNJ	mg/kg	6
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	M	9.3	B	mg/kg	0.5
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	M	0.50		mg/kg	0.5
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	M	0.22	U*	mg/kg	1
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	M	17.5		mg/kg	1
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	M	29.2	*	mg/kg	2.5
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	M	26.4	*	mg/kg	0.3
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	M	0.06	U	mg/kg	0.1
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	M	31.0	*	mg/kg	4
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	M	0.25	B	mg/kg	0.5
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	M	0.76	U	mg/kg	1
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M		M	0.54	UNWJ	mg/kg	1
SU-43	D-6	0-2	IN	SURFACE SOIL SAMPLE	M		M	110	N*J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						FOR	UNITS				
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	2-Chlorophenol	ug/kg	0	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	3-Nitroaniline	ug/kg	24	J	ug/kg	1600
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Aconaphthene	ug/kg	2	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	4-Nitroaniline	ug/kg	30	J	ug/kg	1600
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	ug/kg	10	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	bis(2-Chloroethyl)ether	ug/kg	0	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Anthracene	ug/kg	17	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	ug/kg	16	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	ug/kg	39	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	ug/kg	35	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	ug/kg	30	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	ug/kg	40	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	ug/kg	50	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	ug/kg	20	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	ug/kg	50	J	ug/kg	330
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Anilmony	mg/kg	4.7	UNJ	mg/kg	6
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	mg/kg	7.0	B	mg/kg	0.5
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	mg/kg	0.47	B	mg/kg	0.5
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	mg/kg	1.0	.	mg/kg	1
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	mg/kg	14	.	mg/kg	1
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	mg/kg	45.3	.	mg/kg	2.5
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	mg/kg	77	.	mg/kg	0.3
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	mg/kg	0.055	U	mg/kg	0.1
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	mg/kg	17.9	.	mg/kg	4
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	mg/kg	0.17	UW	mg/kg	0.5
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	mg/kg	0.77	U	mg/kg	1
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	mg/kg	0.45	UNWJ	mg/kg	1
SU-44	D-7	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	mg/kg	60.3	N*J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			DETECTION		
						RESULTS	QUALIFIER	UNITS	UNITS	UNIT	UNIT
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene		11000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Anthracene	J	2200		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene		23000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene		25000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene		15000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene		17000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene		20000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		14000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene		15000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene		10000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Dibenz(a,h)Anthracene		3500		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene		0000		ug/kg	300
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	UNJ	4.3		mg/kg	6
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	B	4.0		mg/kg	0.5
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	U	0.25		mg/kg	0.5
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	*	1.9		mg/kg	1
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	*	12.5		mg/kg	2.5
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	*	11.9		mg/kg	0.3
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	*	32.4		mg/kg	0.1
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	U	0.053		mg/kg	0.1
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	*	13.8		mg/kg	4
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	UW	0.19		mg/kg	0.5
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	U	0.71		mg/kg	1
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	UNWJ	0.5		mg/kg	1
SU-45	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	N-J	43.9		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	5100		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Anthraco	970	J	ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	7500		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	11000		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	5000		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	6700		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	3400		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	6000		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	6600		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	4000		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Dibenz(a,h)Anthracene	1900	J	ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	4700		ug/kg	330
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.2	UNJ	mg/kg	6
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	7.2	B	mg/kg	0.5
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.40	B	mg/kg	0.5
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	1.0	*	mg/kg	1
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	13.0	*	mg/kg	1
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	10.4	*	mg/kg	2.5
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	54.9	*	mg/kg	0.3
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.056	U	mg/kg	0.1
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	19.7	*	mg/kg	4
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.23	BW	mg/kg	0.5
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	1.0		mg/kg	1
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.51	UNWJ	mg/kg	1
SU-46	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	113	N*J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS						DETECTION				
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	FOR	RESULTS	QUALIFIER	UNITS	LIMIT
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	160	J	ug/kg	330
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	130	J	ug/kg	330
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.7	UNJ	mg/kg	6
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	14.4		mg/kg	0.5
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.59		mg/kg	0.5
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.59	*	mg/kg	1
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	10		mg/kg	1
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	29.3	*	mg/kg	2.5
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	41.2	*	mg/kg	0.3
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.056	U	mg/kg	0.1
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	29.6	*	mg/kg	4
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.44	BW	mg/kg	0.5
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.77	U	mg/kg	1
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.49	UNWJ	mg/kg	1
SU-47	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	111	N*J	mg/kg	2
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	170	J	ug/kg	330
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	300	J	ug/kg	330
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	270	J	ug/kg	330
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	170	J	ug/kg	330
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	130	J	ug/kg	330
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	4.9	UNJ	mg/kg	6
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	10.8	S	mg/kg	0.5
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.49	B	mg/kg	0.5
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	0.05	*	mg/kg	1
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	15.4		mg/kg	1
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	32.7	*	mg/kg	2.5
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	43.7	*	mg/kg	0.3
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.06	U	mg/kg	0.1
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	31.8	*	mg/kg	4
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.59	BW	mg/kg	0.5
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.0	U	mg/kg	1
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.56	UNWJ	mg/kg	1
SU-48	E-6	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	190	N*J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS QUALIFIER		DETECTION UNIT	
						SV	SV			UNITS	UNIT
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Phenanthrene	240	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Fluoranthene	450		ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Pyrene	460		ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Benzo(a)Anthracene	220	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Chrysene	250	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Benzo(k)Fluoranthene	130	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Benzo(b)Fluoranthene	320	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Benzo(a)Pyrene	220	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Indeno(1,2,3-cd)Pyrene	140	J	ug/kg	330
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Antimony	4.9	UNJ	mg/kg	8
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Arsenic	16.0	S	mg/kg	0.5
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Borillium	0.49	B	mg/kg	0.5
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Cadmium	0.85	*	mg/kg	1
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Chromium	15.4	*	mg/kg	1
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Copper	32.7	*	mg/kg	2.5
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Lead	43.7	*	mg/kg	0.3
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Mercury	0.06	U	mg/kg	0.1
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Nickel	31.8	*	mg/kg	4
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Selenium	0.59	DW	mg/kg	0.5
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Silver	0.0	U	mg/kg	1
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Thallium	0.56	UNWJ	mg/kg	1
SU-49	B-4	0-2	IN	SURFACE SOIL SAMPLE			Zinc	190	N*J	mg/kg	2
AB1-SS1	B-2	3-5	IN	AUGER BORING	V		ALL VOLATILES	ND	NA	ug/kg	NA
AB1-SS1	B-2	3-5	IN	AUGER BORING	SV		ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Antimony	4.0	UNR	mg/kg	6
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Arsenic	22.9	NJ	mg/kg	1
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Borillium	0.59		mg/kg	0.5
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Cadmium	0.47	B	mg/kg	0.5
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Chromium	17.3		mg/kg	1
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Copper	34.7		mg/kg	2.5
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Lead	22		mg/kg	0.3
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Mercury	0.059	U	mg/kg	0.1
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Nickel	35.3		mg/kg	4
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Selenium	0.2	UNWJ	mg/kg	0.5
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Silver	0.70	U	mg/kg	1
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Thallium	1.2	BNJ	mg/kg	1
AB1-SS1	B-2	3-5	IN	AUGER BORING	M		Zinc	101		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						FOR	FOR				
AB1-SS2	B-2	0-10	IN	AUGER BORING	V	Ethylbenzene		6700		ug/kg	5
AB1-SS2	B-2	0-10	IN	AUGER BORING	V	m/p-Xylene		6000		ug/kg	5
AB1-SS2	B-2	0-10	IN	AUGER BORING	V	o-Xylene		12000	J	ug/kg	5
AB1-SS2	B-2	0-10	IN	AUGER BORING	SV	Naphthalene		130	UNR	ug/kg	330
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Antimony		4.7		mg/kg	6
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Arsenic		16.1	NJ	mg/kg	1
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Beryllium		0.35	B	mg/kg	0.5
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Cadmium		0.35	B	mg/kg	0.5
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Chromium		10.0		mg/kg	1
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Copper		25.6		mg/kg	2.5
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Lead		22.0	*	mg/kg	0.3
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Mercury		0.050	U	mg/kg	0.1
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Nickel		29		mg/kg	4
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Selenium		0.52	BNWJ	mg/kg	0.5
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Silver		0.77	U	mg/kg	1
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Thallium		0.47	BNJ	mg/kg	1
AB1-SS2	B-2	0-10	IN	AUGER BORING	M	Zinc		92.1		mg/kg	2
AB2-SS1	B-4	3-5	IN	AUGER BORING	V	Benzene		1	J	ug/kg	5
AB2-SS1	B-4	3-5	IN	AUGER BORING	SV	Naphthalene		1200		ug/kg	330
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Antimony		4.6	UNR	mg/kg	0
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Arsenic		10.0	NJ	mg/kg	1
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Beryllium		0.57	B	mg/kg	0.5
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Cadmium		0.34	B	mg/kg	0.5
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Chromium		14.9		mg/kg	1
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Copper		30.3		mg/kg	2.5
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Lead		17.9		mg/kg	0.3
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Mercury		0.057	U	mg/kg	0.1
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Nickel		37.6		mg/kg	4
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Selenium		0.19	UNWJ	mg/kg	0.5
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Silver		0.75	U	mg/kg	1
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Thallium		1.1	BNJ	mg/kg	1
AB2-SS1	B-4	3-5	IN	AUGER BORING	M	Zinc		91.1		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
AB2-SS2	B-4	0-10	IN	AUGER BORING	V	ALL VOLATILES	ND	NA	ug/kg	NA
AB2-SS2	B-4	0-10	IN	AUGER BORING	SV	Naphthalene	1000	NA	ug/kg	300
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Antimony	4.7	UNR	mg/kg	6
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Arsenic	13.7	NJ	mg/kg	1
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Beryllium	0.35	B	mg/kg	0.5
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Cadmium	0.35	B	mg/kg	0.5
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Chromium	13.4		mg/kg	1
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Copper	25.9		mg/kg	2.5
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Lead	15.3		mg/kg	0.3
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Mercury	0.005	U	mg/kg	0.1
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Nickel	25.9		mg/kg	4
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Selenium	0.59	NJ	mg/kg	0.5
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Silver	0.77	U	mg/kg	1
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Thallium	0.72	BNJ	mg/kg	1
AB2-SS2	B-4	0-10	IN	AUGER BORING	M	Zinc	04		mg/kg	2
AB3-SS1	B-5	3-5	IN	AUGER BORING	V	ALL VOLATILES	ND	NA	ug/kg	NA
AB3-SS1	B-5	3-5	IN	AUGER BORING	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Antimony	4.7	UNR	mg/kg	6
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Arsenic	20.4	NJ	mg/kg	1
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Beryllium	0.50		mg/kg	0.5
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Cadmium	0.50		mg/kg	0.5
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Chromium	17.4		mg/kg	1
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Copper	24.9		mg/kg	2.5
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Lead	20.1	U	mg/kg	0.3
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Mercury	0.06		mg/kg	0.1
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Nickel	25.2		mg/kg	4
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Selenium	0.32	BNJ	mg/kg	0.5
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Silver	0.77	U	mg/kg	1
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Thallium	0.59	BNJ	mg/kg	1
AB3-SS1	B-5	3-5	IN	AUGER BORING	M	Zinc	82.6		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						ALL SEMI-VOLATILES	Benzene				ug/kg	ug/kg
AB3-SS2	B-5	0-10	IN	AUGER BORING	V			39	NA		5	NA
AB3-SS2	B-5	0-10	IN	AUGER BORING	SV			ND	UNR		6	6
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			4.5		mg/kg	1	0.5
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			12.0		mg/kg	0.5	0.5
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.34		mg/kg	1	0.5
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.45		mg/kg	1	0.5
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			10.0		mg/kg	2.5	0.3
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			20		mg/kg	0.1	0.1
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			14.0		mg/kg	4	0.5
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.057		mg/kg	1	1
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			21.0		mg/kg	2	2
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.55		mg/kg	1	1
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.74		mg/kg	1	1
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.36		mg/kg	1	1
AB3-SS2	B-5	0-10	IN	AUGER BORING	M			0.09		mg/kg	2	2
AB4-SS1	B-6	3-5	IN	AUGER BORING	V	ALL VOLATILES		ND	NA	ug/kg	NA	NA
AB4-SS1	B-6	3-5	IN	AUGER BORING	SV	Fluoranthene		100	J	ug/kg	330	330
AB4-SS1	B-6	3-5	IN	AUGER BORING	SV	Pyrene		100	J	ug/kg	330	330
AB4-SS1	B-6	3-5	IN	AUGER BORING	SV	Benzo(b)Fluoranthene		170	J	ug/kg	330	330
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Antimony		5	UNR	mg/kg	6	6
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Arsenic		15.2		mg/kg	1	0.5
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Beryllium		1		mg/kg	0.5	0.5
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Cadmium		0.5	B	mg/kg	1	1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Chromium		22.3		mg/kg	2.5	0.3
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Copper		21.2		mg/kg	0.1	0.1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Lead		302		mg/kg	4	0.5
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Mercury		0.08		mg/kg	1	1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Nickel		21.0		mg/kg	1	1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Selenium		0.47		mg/kg	1	1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Silver		0.83		mg/kg	1	1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Thallium		0.81		mg/kg	1	1
AB4-SS1	B-6	3-5	IN	AUGER BORING	M	Zinc		168		mg/kg	2	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
AB4-SS2	B-6	0-10	IN	AUGER BORING	V	Acetone	250	D	ug/kg	100
AB4-SS2	B-6	0-10	IN	AUGER BORING	V	Ethylbenzene	20		ug/kg	5
AB4-SS2	B-6	0-10	IN	AUGER BORING	V	m/p-Xylene	30		ug/kg	5
AB4-SS2	B-6	0-10	IN	AUGER BORING	V	o-Xylene	51		ug/kg	5
AB4-SS2	B-6	0-10	IN	AUGER BORING	SV	Naphthalene	000		ug/kg	300
AB4-SS2	B-6	0-10	IN	AUGER BORING	SV	Phenanthrene	160	J	ug/kg	300
AB4-SS2	B-6	0-10	IN	AUGER BORING	SV	Fluoranthene	160	J	ug/kg	300
AB4-SS2	B-0	0-10	IN	AUGER BORING	SV	Pyrene	120	J	ug/kg	300
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Antimony	4.5	UNR	mg/kg	6
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Arsenic	10.3	NJ	mg/kg	1
AB4-SS2	B-6	0-10	IN	AUGER BORING	M	Beryllium	0.79		mg/kg	0.5
AB4-SS2	B-6	0-10	IN	AUGER BORING	M	Cadmium	0.45	B	mg/kg	0.5
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Chromium	10.0		mg/kg	1
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Copper	20.4		mg/kg	2.5
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Lead	20.3	*	mg/kg	0.3
AB4-SS2	B-6	0-10	IN	AUGER BORING	M	Mercury	0.050	U	mg/kg	0.1
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Nickel	27.0		mg/kg	4
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Selenium	0.35	BNWJ	mg/kg	0.5
AB4-SS2	B-6	0-10	IN	AUGER BORING	M	Silver	0.74	U	mg/kg	1
AB4-SS2	B-0	0-10	IN	AUGER BORING	M	Thallium	0.46	BNJ	mg/kg	1
AB4-SS2	B-6	0-10	IN	AUGER BORING	M	Zinc	90.3		mg/kg	2
AB5-SS1	C-2	3-5	IN	AUGER BORING	V	ALL VOLATILES	ND	NA	ug/kg	NA
AB5-SS1	C-2	3-5	IN	AUGER BORING	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Antimony	4.5	UNR	mg/kg	6
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Arsenic	13.9	NJ	mg/kg	1
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Beryllium	0.67		mg/kg	0.5
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Cadmium	0.45	B	mg/kg	0.5
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Chromium	16.5		mg/kg	1
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Copper	29.4		mg/kg	2.5
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Lead	10.1	U	mg/kg	0.3
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Mercury	0.050		mg/kg	0.1
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Nickel	31.1		mg/kg	4
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Selenium	0.2	BNWJ	mg/kg	0.5
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Silver	0.74	U	mg/kg	1
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Thallium	0.53	BNJ	mg/kg	1
AB5-SS1	C-2	3-5	IN	AUGER BORING	M	Zinc	90.3		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION	
						ALL VOLATILES	ALL SEMI-VOLATILES				UNIT	UNIT
AB5-SS2	C-2	0-10	IN	AUGER BORING	V	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA	NA
AB5-SS2	C-2	0-10	IN	AUGER BORING	SV	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA	NA
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	4.5	UNR	mg/kg	6	6
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	14.4	NJ	mg/kg	1	1
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.33	B	mg/kg	0.5	0.5
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.22	B	mg/kg	0.5	0.5
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	11.6		mg/kg	1	1
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	27.1		mg/kg	2.5	2.5
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	15.4		mg/kg	0.3	0.3
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.057	U	mg/kg	0.1	0.1
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	24.0		mg/kg	4	4
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.55	BNWJ	mg/kg	0.5	0.5
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.74	U	mg/kg	1	1
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.38	BNJ	mg/kg	1	1
AB5-SS2	C-2	0-10	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	05.0		mg/kg	2	2
AB6-SS1	C-4	3-5	IN	AUGER BORING	V	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA	NA
AB6-SS1	C-4	3-5	IN	AUGER BORING	SV	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA	NA
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	4.5	UNR	mg/kg	6	6
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	22.2	NJ	mg/kg	1	1
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.33	B	mg/kg	0.5	0.5
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	3.3		mg/kg	0.5	0.5
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	16.5		mg/kg	1	1
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	18.9		mg/kg	2.5	2.5
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	19.5	*	mg/kg	0.3	0.3
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.050	U	mg/kg	0.1	0.1
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	25.2		mg/kg	4	4
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.29	BNWJ	mg/kg	0.5	0.5
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.73	U	mg/kg	1	1
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	0.80	BNJ	mg/kg	1	1
AB6-SS1	C-4	3-5	IN	AUGER BORING	M	ALL VOLATILES	ALL SEMI-VOLATILES	83.1		mg/kg	2	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL SEMI-VOLATILES	Benzone				
AB6-SS2	C-4	0-10	IN	AUGER BORING	V	ALL SEMI-VOLATILES	Benzone	1	J	ug/kg	5
AB6-SS2	C-4	0-10	IN	AUGER BORING	SV	ALL SEMI-VOLATILES	Antimony	ND	NA	ug/kg	NA
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Antimony	3.9	UNR	mg/kg	6
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Arsenic	20.3	NJ	mg/kg	1
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Beryllium	0.22	U	mg/kg	0.5
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Cadmium	0.49	U	mg/kg	0.5
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Chromium	12.4		mg/kg	1
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Copper	25.7		mg/kg	2.5
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Lead	14.0		mg/kg	0.3
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Mercury	0.06	U	mg/kg	0.1
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Nickel	20.3		mg/kg	4
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Selenium	0.53	BNWJ	mg/kg	0.5
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Silver	0.64	U	mg/kg	1
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Thallium	0.39	BNJ	mg/kg	1
AB6-SS2	C-4	0-10	IN	AUGER BORING	M	ALL SEMI-VOLATILES	Zinc	85.7		mg/kg	2
AB7-SS1	C-7	3-5	OUT	AUGER BORING	V	Methylene Chloride	Methylene Chloride	130	B	ug/kg	5
AB7-SS1	C-7	3-5	OUT	AUGER BORING	SV	ALL SEMI-VOLATILES	Antimony	ND	NA	ug/kg	NA
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Arsenic	5.1	UNR	mg/kg	6
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Beryllium	10.2	NJ	mg/kg	1
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Cadmium	0.03		mg/kg	0.5
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Chromium	0.30	B	mg/kg	0.5
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Copper	17.0		mg/kg	1
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Lead	30.0		mg/kg	2.5
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Mercury	17.6	U	mg/kg	0.3
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Nickel	0.061		mg/kg	0.1
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Selenium	35.6	UNJ	mg/kg	4
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Silver	0.2	U	mg/kg	0.5
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Thallium	0.03	U	mg/kg	1
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Zinc	0.73	BNJ	mg/kg	1
AB7-SS1	C-7	3-5	OUT	AUGER BORING	M	ALL SEMI-VOLATILES	Zinc	99.7		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
AB7-SS2	C-7	8-10	OUT	AUGER BORING	V		Antimony	ND	NA	ug/kg	NA
AB7-SS2	C-7	8-10	OUT	AUGER BORING	SV		Arsenic	ND	NA	ug/kg	NA
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Beryllium	4.4	UNR	mg/kg	6
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Cadmium	21	NJ	mg/kg	1
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Chromium	0.33	B	mg/kg	0.5
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Copper	0.55		mg/kg	0.5
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Lead	11.5		mg/kg	1
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Mercury	23.0		mg/kg	2.5
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Nickel	16.7	U	mg/kg	0.3
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Selenium	0.057		mg/kg	0.1
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Silver	25.7	BNWJ	mg/kg	4
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Thallium	0.34		mg/kg	0.5
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M		Zinc	0.72	U	mg/kg	1
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M			0.54	BNJ	mg/kg	1
AB7-SS2	C-7	8-10	OUT	AUGER BORING	M			82.9		mg/kg	2
AB8-SS1	D-2	3-5	IN	AUGER BORING	V		Antimony	ND	NA	ug/kg	NA
AB8-SS1	D-2	3-5	IN	AUGER BORING	SV		Arsenic	ND	NA	ug/kg	NA
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Beryllium	4.5	UNR	mg/kg	6
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Cadmium	16.0	NJ	mg/kg	1
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Chromium	0.45	B	mg/kg	0.5
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Copper	0.60		mg/kg	0.5
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Lead	13.6		mg/kg	1
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Mercury	20		mg/kg	2.5
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Nickel	15.7	U	mg/kg	0.3
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Selenium	0.057		mg/kg	0.1
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Thallium	30	BNWJ	mg/kg	4
AB8-SS1	D-2	3-5	IN	AUGER BORING	M		Zinc	0.25		mg/kg	0.5
AB8-SS1	D-2	3-5	IN	AUGER BORING	M			0.74	U	mg/kg	1
AB8-SS1	D-2	3-5	IN	AUGER BORING	M			0.63	BNJ	mg/kg	1
AB8-SS1	D-2	3-5	IN	AUGER BORING	M			82.2		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
AB8-SS2	D-2	0-10	IN	AUGER BORING	V		ALL VOLATILES	ND	NA	ug/kg	NA
AB8-SS2	D-2	0-10	IN	AUGER BORING	SV		ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Antimony	5	UNR	mg/kg	0
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Arsenic	17.4	NJ	mg/kg	1
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Beryllium	0.37	B	mg/kg	0.5
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Cadmium	0.37	B	mg/kg	0.5
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Chromium	15.9		mg/kg	1
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Copper	30.2		mg/kg	2.5
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Lead	14.9		mg/kg	0.3
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Mercury	0.059	U	mg/kg	0.1
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Nickel	22.2		mg/kg	4
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Selenium	0.35	BNWJ	mg/kg	0.5
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Silver	0.02	U	mg/kg	1
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Thallium	0.46	BNJ	mg/kg	1
AB8-SS2	D-2	0-10	IN	AUGER BORING	M		Zinc	93.7		mg/kg	2
AB9-SS1	D-4	3-5	IN	AUGER BORING	V		ALL VOLATILES	ND	NA	ug/kg	NA
AB9-SS1	D-4	3-5	IN	AUGER BORING	SV		ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Antimony	4.9	UNR	mg/kg	0
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Arsenic	20.7	NJ	mg/kg	1
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Beryllium	0.49	B	mg/kg	0.5
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Cadmium	0.49	B	mg/kg	0.5
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Chromium	16.9		mg/kg	1
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Copper	27.7		mg/kg	2.5
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Lead	27.7	S	mg/kg	0.3
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Mercury	0.08	U	mg/kg	0.1
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Nickel	30.8		mg/kg	4
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Selenium	0.21	UNJ	mg/kg	0.5
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Silver	0.01	U	mg/kg	1
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Thallium	0.40	BNJ	mg/kg	1
AB9-SS1	D-4	3-5	IN	AUGER BORING	M		Zinc	97.2		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						V	SV				
AB9-SS2	D-4	0-10	IN	AUGER BORING		ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB9-SS2	D-4	0-10	IN	AUGER BORING				ND	NA	ug/kg	NA
AB9-SS2	D-4	0-10	IN	AUGER BORING				6	BNJ	mg/kg	6
AB9-SS2	D-4	0-10	IN	AUGER BORING				10.1	NJ	mg/kg	1
AB9-SS2	D-4	0-10	IN	AUGER BORING				0.64		mg/kg	0.5
AB9-SS2	D-4	0-10	IN	AUGER BORING				0.51	B	mg/kg	0.5
AB9-SS2	D-4	0-10	IN	AUGER BORING				17.3		mg/kg	1
AB9-SS2	D-4	0-10	IN	AUGER BORING				24.9		mg/kg	2.5
AB9-SS2	D-4	0-10	IN	AUGER BORING				19.5		mg/kg	0.3
AB9-SS2	D-4	0-10	IN	AUGER BORING				0.06	U	mg/kg	0.1
AB9-SS2	D-4	0-10	IN	AUGER BORING				30.7		mg/kg	4
AB9-SS2	D-4	0-10	IN	AUGER BORING				0.21	UNJ	mg/kg	0.5
AB9-SS2	D-4	0-10	IN	AUGER BORING				0.84	U	mg/kg	1
AB9-SS2	D-4	0-10	IN	AUGER BORING				0.74	BNJ	mg/kg	1
AB9-SS2	D-4	0-10	IN	AUGER BORING				90.9		mg/kg	2
AB10-SS1	D-5	3-5	IN	AUGER BORING		ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
AB10-SS1	D-5	3-5	IN	AUGER BORING				4.7	NA	ug/kg	NA
AB10-SS1	D-5	3-5	IN	AUGER BORING				21	UNR	mg/kg	6
AB10-SS1	D-5	3-5	IN	AUGER BORING				0.50	NJ	mg/kg	1
AB10-SS1	D-5	3-5	IN	AUGER BORING				0.35	B	mg/kg	0.5
AB10-SS1	D-5	3-5	IN	AUGER BORING				17.0		mg/kg	1
AB10-SS1	D-5	3-5	IN	AUGER BORING				29.4		mg/kg	2.5
AB10-SS1	D-5	3-5	IN	AUGER BORING				17.6	U	mg/kg	0.3
AB10-SS1	D-5	3-5	IN	AUGER BORING				0.06		mg/kg	0.1
AB10-SS1	D-5	3-5	IN	AUGER BORING				20.6		mg/kg	4
AB10-SS1	D-5	3-5	IN	AUGER BORING				0.19	UNJ	mg/kg	0.5
AB10-SS1	D-5	3-5	IN	AUGER BORING				0.76	U	mg/kg	1
AB10-SS1	D-5	3-5	IN	AUGER BORING				0.56	BNJ	mg/kg	1
AB10-SS1	D-5	3-5	IN	AUGER BORING				90.5		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						FOR					
AB12-SS7	C-5	21-23	IN	AUGER BORING	V	o-Xylene		6	J	ug/kg	5
AB12-SS7	C-5	21-23	IN	AUGER BORING	V	1,3-Dichlorobenzene		6	J	ug/kg	5
AB12-SS7	C-5	21-23	IN	AUGER BORING	V	1,2/1,4-Dichlorobenzene		6	J	ug/kg	5
AB12-SS7	C-5	21-23	IN	AUGER BORING	SV	ALL SEMI-VOLATILES		ND	NA	ug/kg	NA
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Antimony		3.9	UNJ	mg/kg	6
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Arsenic		0.6	B	mg/kg	1
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Beryllium		0.30	B	mg/kg	0.5
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Cadmium		0.10	U	mg/kg	0.5
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Chromium		0.5	.	mg/kg	1
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Copper		21.7	NJ	mg/kg	2.5
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Lead		14.1	N*J	mg/kg	0.3
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Mercury		0.064	U	mg/kg	0.1
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Nickel		14.5		mg/kg	4
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Selenium		0.26	BW	mg/kg	0.5
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Silver		0.63	U	mg/kg	1
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Thallium		0.12	BNWJ	mg/kg	1
AB12-SS7	C-5	21-23	IN	AUGER BORING	M	Zinc		32.0	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			RESULTS			UNITS	DETECTION LIMIT
						V	SV	ALL VOLATILES ALL SEMI-VOLATILES	ND	QUAUFIER	NA		
AB13-SS5	C-3	17-19	IN	AUGER BORING				ALL VOLATILES	ND	NA	NA	ug/kg	NA
AB13-SS5	C-3	17-19	IN	AUGER BORING				Antimony	ND	NA	NA	ug/kg	NA
AB13-SS5	C-3	17-19	IN	AUGER BORING				Arsenic	4.2	UNJ	UNJ	mg/kg	6
AB13-SS5	C-3	17-19	IN	AUGER BORING				Beryllium	5.0	B	B	mg/kg	1
AB13-SS5	C-3	17-19	IN	AUGER BORING				Cadmium	0.31	B	B	mg/kg	0.5
AB13-SS5	C-3	17-19	IN	AUGER BORING				Chromium	0.2	U	U	mg/kg	0.5
AB13-SS5	C-3	17-19	IN	AUGER BORING				Copper	6.7			mg/kg	1
AB13-SS5	C-3	17-19	IN	AUGER BORING				Lead	42.0	NJ	NJ	mg/kg	2.5
AB13-SS5	C-3	17-19	IN	AUGER BORING				Mercury	10.2	N*J	N*J	mg/kg	0.3
AB13-SS5	C-3	17-19	IN	AUGER BORING				Nickel	0.17			mg/kg	0.1
AB13-SS5	C-3	17-19	IN	AUGER BORING				Selenium	0.0	BW	BW	mg/kg	4
AB13-SS5	C-3	17-19	IN	AUGER BORING				Silver	0.32	U	U	mg/kg	0.5
AB13-SS5	C-3	17-19	IN	AUGER BORING				Thallium	0.69	UNWJ	UNWJ	mg/kg	1
AB13-SS5	C-3	17-19	IN	AUGER BORING				Zinc	0.11			mg/kg	1
AB13-SS5	C-3	17-19	IN	AUGER BORING					47.9	NJ	NJ	mg/kg	2
AB13-SS7	C-3	21-23	IN	AUGER BORING				ALL VOLATILES	ND	NA	NA	ug/kg	NA
AB13-SS7	C-3	21-23	IN	AUGER BORING				ALL SEMI-VOLATILES	ND	NA	NA	ug/kg	NA
AB13-SS7	C-3	21-23	IN	AUGER BORING				Antimony	1.0	UNJ	UNJ	mg/kg	6
AB13-SS7	C-3	21-23	IN	AUGER BORING				Arsenic	9.5			mg/kg	1
AB13-SS7	C-3	21-23	IN	AUGER BORING				Beryllium	0.10	B	B	mg/kg	0.5
AB13-SS7	C-3	21-23	IN	AUGER BORING				Cadmium	0.080	B	B	mg/kg	0.5
AB13-SS7	C-3	21-23	IN	AUGER BORING				Chromium	4.0			mg/kg	1
AB13-SS7	C-3	21-23	IN	AUGER BORING				Copper	42.9	NJ	NJ	mg/kg	2.5
AB13-SS7	C-3	21-23	IN	AUGER BORING				Lead	10.1	N*J	N*J	mg/kg	0.3
AB13-SS7	C-3	21-23	IN	AUGER BORING				Mercury	0.053	U	U	mg/kg	0.1
AB13-SS7	C-3	21-23	IN	AUGER BORING				Nickel	8.0			mg/kg	4
AB13-SS7	C-3	21-23	IN	AUGER BORING				Selenium	0.24	B	B	mg/kg	0.5
AB13-SS7	C-3	21-23	IN	AUGER BORING				Silver	0.29	U	U	mg/kg	1
AB13-SS7	C-3	21-23	IN	AUGER BORING				Thallium	0.005	UNWJ	UNWJ	mg/kg	1
AB13-SS7	C-3	21-23	IN	AUGER BORING				Zinc	65.1	NJ	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS			DETECTION		
						FOR	RESULTS	QUALIFIER	UNITS	LIMIT	UNIT
AB14-SS2	C-6	0-10	IN	AUGER BORING	V	Benzene	15000		ug/kg	5	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	V	Ethylbenzene	15000		ug/kg	5	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	V	m/p-Xylene	15000		ug/kg	5	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	V	o-Xylene	27000		ug/kg	5	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	SV	Naphthalene	460		ug/kg	330	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	SV	2-Methylnaphthalene	590		ug/kg	330	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	SV	DI-n-Butyl Phthalate	120	J	ug/kg	330	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Antimony	3.3	UNJ	ug/kg	6	ug/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Arsenic	16.9		mg/kg	1	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Beryllium	0.66		mg/kg	0.5	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Cadmium	0.25	B	mg/kg	0.5	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Chromium	13.9		mg/kg	1	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Copper	33.5	NJ	mg/kg	2.5	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Lead	19.6	N*J	mg/kg	0.3	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Mercury	0.057	U	mg/kg	0.1	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Nickel	31.0		mg/kg	4	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Selenium	0.3	BW	mg/kg	0.5	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Silver	0.55	U	mg/kg	1	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Thallium	0.29	BNWJ	mg/kg	1	mg/kg
AB14-SS2	C-6	0-10	IN	AUGER BORING	M	Zinc	82.7	NJ	mg/kg	2	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	V	Benzene	6		ug/kg	5	ug/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA	ug/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Antimony	3.2	UNJ	mg/kg	6	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Arsenic	61.2		mg/kg	1	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Beryllium	0.32	B	mg/kg	0.5	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Cadmium	0.16	B	mg/kg	0.5	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Chromium	9.4		mg/kg	1	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Copper	40	NJ	mg/kg	2.5	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Lead	22.9	N*J	mg/kg	0.3	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Mercury	0.055	U	mg/kg	0.1	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Nickel	15.3		mg/kg	4	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Selenium	0.6	W	mg/kg	0.5	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Silver	0.53	U	mg/kg	1	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Thallium	0.09	UNWJ	mg/kg	1	mg/kg
AB14-SS7	C-6	21-25	IN	AUGER BORING	M	Zinc	73.6	NJ	mg/kg	2	mg/kg

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #				GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
AB15-SS3		D-5	13-15	IN	AUGER BORING	V	ALL SEMI-VOLATILES	Acetone	640		ug/kg	100		
AB15-SS3		D-5	13-15	IN	AUGER BORING	V		Ethylbenzene	250		ug/kg	5		
AB15-SS3		D-5	13-15	IN	AUGER BORING	SV		Antimony	ND	NA	ug/kg	NA		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Arsenic	4.9	UNJ	mg/kg	6		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Beryllium	14.0		mg/kg	1		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Cadmium	0.73		mg/kg	0.5		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Chromium	0.23	U	mg/kg	0.5		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Copper	10.2		mg/kg	1		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Lead	23.7	NJ	mg/kg	2.5		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Mercury	15.0	N*J	mg/kg	0.3		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Nickel	0.090	B	mg/kg	0.1		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Selenium	27.2		mg/kg	4		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Silver	0.21	UW	mg/kg	0.5		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Thallium	0.0	U	mg/kg	1		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M		Zinc	0.11	UNW	mg/kg	1		
AB15-SS3		D-5	13-15	IN	AUGER BORING	M			76.0	NJ	mg/kg	2		
AB15-SS0		D-5	25-27	IN	AUGER BORING	V	ALL SEMI-VOLATILES	Trichloroethene	4	J	ug/kg	5		
AB15-SS0		D-5	25-27	IN	AUGER BORING	SV		Antimony	ND	NA	ug/kg	NA		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Arsenic	2.6	UNJ	mg/kg	6		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Beryllium	14.5		mg/kg	1		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Cadmium	0.72		mg/kg	0.5		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Chromium	0.13	B	mg/kg	0.5		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Copper	10.4		mg/kg	1		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Lead	19.9	NJ	mg/kg	2.5		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Mercury	13.2	N*J	mg/kg	0.3		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Nickel	0.16		mg/kg	0.1		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Selenium	30.3		mg/kg	4		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Silver	0.31	BW	mg/kg	0.5		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Thallium	0.43	U	mg/kg	1		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M		Zinc	0.094	UNW	mg/kg	1		
AB15-SS0		D-5	25-27	IN	AUGER BORING	M			60.0	NJ	mg/kg	2		

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	V	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	SV		Antimony	ND	NA	ug/kg	NA
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Arsenic	3.2	UNJ	mg/kg	6
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Beryllium	17.4		mg/kg	1
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Cadmium	0.39		mg/kg	0.5
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Chromium	0.24	B	mg/kg	0.5
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Copper	9.1		mg/kg	1
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Lead	20.7	NJ	mg/kg	2.5
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Mercury	15.7	N-J	mg/kg	0.3
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Nickel	0.057	U	mg/kg	0.1
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Selenium	24		mg/kg	4
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Silver	0.10	BW	mg/kg	0.5
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Thallium	0.52	U	mg/kg	1
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M		Zinc	0.34	BNWJ	mg/kg	1
MW4-SS2	B-1	0-10	OUT	MONITORING WELL	M			81	NJ	mg/kg	2
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	V	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	SV		Antimony	ND	NA	ug/kg	NA
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Arsenic	3.4	UNJ	mg/kg	6
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Beryllium	9.1		mg/kg	1
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Cadmium	0.43		mg/kg	0.5
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Chromium	0.60		mg/kg	0.5
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Copper	11.2		mg/kg	1
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Lead	19.7	NJ	mg/kg	2.5
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Mercury	15.1	N-J	mg/kg	0.3
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Nickel	0.057	U	mg/kg	0.1
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Selenium	25.2		mg/kg	4
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Silver	0.57	W	mg/kg	0.5
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Thallium	0.56	U	mg/kg	1
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M		Zinc	0.27	BNWJ	mg/kg	1
MW4-SS3	B-1	13-15	OUT	MONITORING WELL	M			91.1	NJ	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	DETECTION	
						ALL VOLATILES	ALL SEMI-VOLATILES			UNITS	UNIT
MW5-SS2	B-4	8-10	IN	MONITORING WELL	V	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW5-SS2	B-4	0-10	IN	MONITORING WELL	SV	Antimony	Antimony	ND	NA	ug/kg	NA
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Arsenic	Arsenic	4.5	UNR	mg/kg	8
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Beryllium	Beryllium	20	NU	mg/kg	1
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Cadmium	Cadmium	0.57	B	mg/kg	0.5
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Chromium	Chromium	0.23	B	mg/kg	0.5
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Copper	Copper	10.5	.	mg/kg	1
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Lead	Lead	26.2	NSJ	mg/kg	2.5
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Mercury	Mercury	10.0	U	mg/kg	0.3
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Nickel	Nickel	0.055	.	mg/kg	0.1
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Selenium	Selenium	20	N+J	mg/kg	4
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Silver	Silver	0.51	U	mg/kg	0.5
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Thallium	Thallium	0.75	B	mg/kg	1
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M	Zinc	Zinc	0.31	U	mg/kg	1
MW5-SS2	B-4	0-10	IN	MONITORING WELL	M			02		mg/kg	2
MW5-SS3	B-4	13-15	IN	MONITORING WELL	V	Elthylbenzene	Elthylbenzene	7400		ug/kg	5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	V	m/p-Xylene	m/p-Xylene	1900		ug/kg	5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	V	o-Xylene	o-Xylene	7000	J	ug/kg	5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	SV	Naphthalene	Naphthalene	160		ug/kg	330
MW5-SS3	B-4	13-15	IN	MONITORING WELL	SV	2-Methylnaphthalene	2-Methylnaphthalene	460		ug/kg	330
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Antimony	Antimony	4.2	UNR	mg/kg	6
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Arsenic	Arsenic	0.3	NU	mg/kg	1
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Beryllium	Beryllium	0.32	B	mg/kg	0.5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Cadmium	Cadmium	0.21	B	mg/kg	0.5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Chromium	Chromium	9.0	.	mg/kg	1
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Copper	Copper	57.4	NU	mg/kg	2.5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Lead	Lead	17.8	U	mg/kg	0.3
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Mercury	Mercury	0.050	U	mg/kg	0.1
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Nickel	Nickel	13.7	BNSJ	mg/kg	4
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Selenium	Selenium	0.10	U	mg/kg	0.5
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Silver	Silver	0.7	U	mg/kg	1
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Thallium	Thallium	0.050	U	mg/kg	1
MW5-SS3	B-4	13-15	IN	MONITORING WELL	M	Zinc	Zinc	65.0		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	V	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	SV	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Antimony	Antimony	4.4	UNR	mg/kg	6
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Arsenic	Arsenic	19.6	NJ	mg/kg	1
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Boryllium	Boryllium	0.54		mg/kg	0.5
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Cadmium	Cadmium	0.33	B	mg/kg	0.5
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Chromium	Chromium	10		mg/kg	1
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Copper	Copper	29.9	*	mg/kg	2.5
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Lead	Lead	10.7	NSJ	mg/kg	0.3
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Mercury	Mercury	0.057	U	mg/kg	0.1
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Nickel	Nickel	20.0		mg/kg	4
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Selenium	Selenium	0.79	N+J	mg/kg	0.5
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Silver	Silver	0.72	U	mg/kg	1
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Thallium	Thallium	0.29	B	mg/kg	1
MW6-SS2	E-5	0-10	OUT	MONITORING WELL	M	Zinc	Zinc	02.0		mg/kg	2
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	V	Vinyl Chloride	Vinyl Chloride	59	J	ug/kg	10
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	V	1,1-Dichloroethane	1,1-Dichloroethane	2		ug/kg	5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	V	trans-1,2-Dichloroethane	trans-1,2-Dichloroethane	1000	D	ug/kg	5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	V	Trichloroethane	Trichloroethane	40		ug/kg	5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	V	Toluene	Toluene	1	J	ug/kg	5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	SV	ALL SEMI-VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Antimony	Antimony	3.9	UNR	mg/kg	6
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Arsenic	Arsenic	11.3	NJ	mg/kg	1
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Boryllium	Boryllium	0.49		mg/kg	0.5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Cadmium	Cadmium	0.2	B	mg/kg	0.5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Chromium	Chromium	14.5		mg/kg	1
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Copper	Copper	21.6	*	mg/kg	2.5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Lead	Lead	15.1	NSJ	mg/kg	0.3
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Mercury	Mercury	0.057	U	mg/kg	0.1
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Nickel	Nickel	20.5		mg/kg	4
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Selenium	Selenium	0.90	NSJ	mg/kg	0.5
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Silver	Silver	0.05	U	mg/kg	1
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Thallium	Thallium	0.070	UW	mg/kg	1
MW6-SS3	E-5	13-15	OUT	MONITORING WELL	M	Zinc	Zinc	72.0		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS		RESULTS	QUALIFIER	UNITS	DETECTION	
						FOR	UNIT				UNIT	UNIT
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	V	1,1,1-Trichloroethane	ug/kg	88	J	ug/kg	5	5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	V	Benzene	ug/kg	2100		ug/kg	5	5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	V	Ethylbenzene	ug/kg	900		ug/kg	5	5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	V	m/p-Xylene	ug/kg	1000		ug/kg	5	5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	V	o-Xylene	ug/kg	1200		ug/kg	5	5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	SV	ALL SEMI-VOLATILES	ug/kg	ND	NA	ug/kg	NA	NA
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Antimony	mg/kg	4.3	UNJ	mg/kg	6	6
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Arsenic	mg/kg	15.7	NJ	mg/kg	1	1
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Beryllium	mg/kg	0.65		mg/kg	0.5	0.5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Cadmium	mg/kg	0.22	B	mg/kg	0.5	0.5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Chromium	mg/kg	19		mg/kg	1	1
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Copper	mg/kg	26.4	*	mg/kg	2.5	2.5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Lead	mg/kg	19.2	NSJ	mg/kg	0.3	0.3
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Mercury	mg/kg	0.059	U	mg/kg	0.1	0.1
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Nickel	mg/kg	25.7		mg/kg	4	4
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Selenium	mg/kg	0.19	UNJ	mg/kg	0.5	0.5
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Silver	mg/kg	0.71	U	mg/kg	1	1
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Thallium	mg/kg	0.27	BW	mg/kg	1	1
MW7-SS2	D-8	8-10	OUT	MONITORING WELL	M	Zinc	mg/kg	79.9		mg/kg	2	2
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	V	Benzene	ug/kg	140		ug/kg	5	5
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	V	Toluene	ug/kg	4	J	ug/kg	5	5
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	SV	ALL SEMI-VOLATILES	ug/kg	ND	NA	ug/kg	NA	NA
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Antimony	mg/kg	5	UNR	mg/kg	6	6
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Arsenic	mg/kg	15.0	NJ	mg/kg	1	1
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Beryllium	mg/kg	0.75		mg/kg	0.5	0.5
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Cadmium	mg/kg	0.24	U	mg/kg	0.5	0.5
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Chromium	mg/kg	22.4		mg/kg	1	1
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Copper	mg/kg	25.3	*	mg/kg	2.5	2.5
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Lead	mg/kg	25.2	NSJ	mg/kg	0.3	0.3
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Mercury	mg/kg	0.063	-U	mg/kg	0.1	0.1
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Nickel	mg/kg	31.6		mg/kg	4	4
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Selenium	mg/kg	0.32	BNJ	mg/kg	0.5	0.5
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Silver	mg/kg	0.83	U	mg/kg	1	1
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Thallium	mg/kg	0.23	B	mg/kg	1	1
MW7-SS3	D-8	13-15	OUT	MONITORING WELL	M	Zinc	mg/kg	89.6		mg/kg	2	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	V	ALL VOLATILES	Antimony	ND	NA	ug/kg	NA
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	SV	ALL SEMI-VOLATILES	Arsenic	ND	NA	ug/kg	NA
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Beryllium	4.5	UNR	mg/kg	6
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Cadmium	23	U	mg/kg	1
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Chromium	0.50	B	mg/kg	0.5
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Copper	0.22		mg/kg	0.5
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Lead	15.0	*	mg/kg	1
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Mercury	25.7	NSJ	mg/kg	2.5
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Nickel	15.4	U	mg/kg	0.3
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Selenium	0.057	U	mg/kg	0.1
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Silver	32.1	NSJ	mg/kg	4
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Thallium	1.7	U	mg/kg	0.5
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M		Zinc	0.73	UW	mg/kg	1
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M			0.090		mg/kg	1
MW0-SS2	C-10	0-10	OUT	MONITORING WELL	M			0.090		mg/kg	2
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	V	ALL VOLATILES	Benzene	2	J	ug/kg	5
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	SV	ALL SEMI-VOLATILES	Antimony	ND	NA	ug/kg	NA
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Arsenic	5	UNR	mg/kg	6
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Beryllium	5.2	BNJ	mg/kg	1
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Cadmium	0.29	U	mg/kg	0.5
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Chromium	0.24	U	mg/kg	0.5
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Copper	6.1	*	mg/kg	1
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Lead	12		mg/kg	2.5
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Mercury	12.1	NSJ	mg/kg	0.3
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Nickel	0.063	U	mg/kg	0.1
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Selenium	13.1		mg/kg	4
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Silver	0.0	NSJ	mg/kg	0.5
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M		Thallium	0.83	U	mg/kg	1
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M			0.003	U	mg/kg	1
MW0-SS3	C-10	13-15	OUT	MONITORING WELL	M			59.5		mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS FOR					RESULTS	QUALIFIER	UNITS	DETECTION UNIT	
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ALL VOLATILES ALL SEMI-VOLATILES			
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	V		ND	NA	ug/kg
MW9-SS2	A-4	8-10	OUT	MONITORING WELL	SV		ND	NA	ug/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Antimony	4.2	UNR	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Arsenic	16.2	NJ	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Beryllium	0.62		mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Cadmium	0.31	B	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Chromium	13.1		mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Copper	24.6		mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Lead	13.0	NJ	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Mercury	0.050	U	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Nickel	31		mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Selenium	0.40	BS	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Silver	0.60	U	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Thallium	0.4	B	mg/kg
MW9-SS2	A-4	0-10	OUT	MONITORING WELL	M	Zinc	84.7		mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	V		ND	NA	ug/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	SV		ND	NA	ug/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Antimony	4.2	UNR	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Arsenic	22.2	NJ	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Beryllium	0.72		mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Cadmium	0.21	B	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Chromium	13.6		mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Copper	24.9		mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Lead	18.4	NJ	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Mercury	0.062	U	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Nickel	33		mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Selenium	0.21	UW	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Silver	0.60	U	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Thallium	0.49	B	mg/kg
MW9-SS3	A-4	13-15	OUT	MONITORING WELL	M	Zinc	87.1		mg/kg

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES	ALL VOLATILES				
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	V			ALL VOLATILES	ND	NA	ug/kg	NA
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	SV			Antimony	ND	NA	ug/kg	NA
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Arsenic	1.6	J	mg/kg	6
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Beryllium	19.0	J	mg/kg	1
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Cadmium	0.37		mg/kg	0.5
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Chromium	20.6	J	mg/kg	1
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Copper	49.3		mg/kg	2.5
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Lead	20.7		mg/kg	0.3
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Mercury	0.06	U	mg/kg	0.1
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Nickel	32.3		mg/kg	4
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Selenium	0.51	J	mg/kg	0.5
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Silver	0.44	U	mg/kg	1
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Thallium	0.51	J	mg/kg	1
MW10-SS1	A-0	3-5	OUT	MONITORING WELL	M			Zinc	109	J	mg/kg	2
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	V			ALL VOLATILES	ND	NA	ug/kg	NA
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	SV			Antimony	ND	NA	ug/kg	NA
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Arsenic	2.2	J	mg/kg	6
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Beryllium	10.8	J	mg/kg	1
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Cadmium	0.25		mg/kg	0.5
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Chromium	0.72		mg/kg	0.5
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Copper	7.4	J	mg/kg	1
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Lead	22.6		mg/kg	2.5
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Mercury	12.1	J	mg/kg	0.3
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Nickel	0.06	U	mg/kg	0.1
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Selenium	19.7	U	mg/kg	4
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Silver	0.54	U	mg/kg	0.5
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Thallium	0.75	U	mg/kg	1
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M			Zinc	0.54	J	mg/kg	1
MW10-SS3	A-0	13-15	OUT	MONITORING WELL	M				80.3	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	V		ALL VOLATILES	ND	NA	ug/kg	NA
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	SV		ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Antimony	3.3	J	mg/kg	6
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Arsenic	17.9	J	mg/kg	1
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Beryllium	0.41		mg/kg	0.5
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Cadmium	0.83		mg/kg	0.5
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Chromium	9.5	J	mg/kg	1
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Copper	33.4		mg/kg	2.5
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Lead	16.2	J	mg/kg	0.3
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Mercury	0.08	U	mg/kg	0.1
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Nickel	20.2		mg/kg	4
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Selenium	0.38	U	mg/kg	0.5
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Silver	0.66	U	mg/kg	1
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Thallium	0.43	J	mg/kg	1
MW11-SS1	F-7	3-5	OUT	MONITORING WELL	M		Zinc	79.8	J	mg/kg	2
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	V		ALL VOLATILES	ND	NA	ug/kg	NA
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	SV		ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Antimony	2.7	J	mg/kg	6
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Arsenic	13.4	J	mg/kg	1
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Beryllium	0.41		mg/kg	0.5
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Cadmium	0.59		mg/kg	0.5
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Chromium	11.1	J	mg/kg	1
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Copper	22		mg/kg	2.5
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Lead	15.2	J	mg/kg	0.3
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Mercury	0.06	U	mg/kg	0.1
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Nickel	16.0		mg/kg	4
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Selenium	0.5	J	mg/kg	0.5
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Silver	0.63	U	mg/kg	1
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Thallium	0.5	J	mg/kg	1
MW11-SS3	F-7	13-15	OUT	MONITORING WELL	M		Zinc	70.3	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	DETECTION	
						V	SV			UNITS	UNIT
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				ND	NA	ug/kg	NA
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				ND	NA	ug/kg	NA
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				1.4	J	mg/kg	6
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				20.7	J	mg/kg	1
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				0.04		mg/kg	0.5
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				0.52		mg/kg	0.5
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				15.0	J	mg/kg	1
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				38.7		mg/kg	2.5
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				17.7		mg/kg	0.3
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				0.00	U	mg/kg	0.1
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				32.1		mg/kg	4
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				0.30	J	mg/kg	0.5
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				0.40	U	mg/kg	1
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				0.30	J	mg/kg	1
MW12-SS1	E-9	3-5	OUT	MONITORING WELL				80.2	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS		RESULTS	QUALIFIER	UNITS	DETECTION	
						FOR	RESULTS				UNITS	LIMIT
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	V	ALL VOLATILES	ND	NA	NA	ug/kg	NA	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Phenanthrene	300	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Anthracene	02	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Carbazole	190	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Fluoranthene	310	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Pyrene	250	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Benzo(a)Anthracene	110	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Chrysene	130	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Benzo(b)Fluoranthene	110	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	SV	Benzo(a)Pyrene	07	J	J	ug/kg	300	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Antimony	2.9	J	J	mg/kg	6	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Arsenic	4	J	J	mg/kg	1	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Beryllium	0.22			mg/kg	0.5	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Cadmium	0.37			mg/kg	0.5	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Chromium	5.0	J	J	mg/kg	1	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Copper	30.5			mg/kg	2.5	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Lead	11	J	J	mg/kg	0.3	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Mercury	0.05	U	U	mg/kg	0.1	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Nickel	9.7			mg/kg	4	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Selenium	0.26	J	J	mg/kg	0.5	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Silver	0.47	U	U	mg/kg	1	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Thallium	0.26	J	J	mg/kg	1	
MW12-SS3	E-9	13-15	OUT	MONITORING WELL	M	Zinc	50.1	J	J	mg/kg	2	

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL SEMI-VOLATILES	NOT ANALYZED				
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	V		Antimony	ND	NA	ug/kg	NA
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	SV		Arsenic	2.5	J	mg/kg	6
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Beryllium	12.6	J	mg/kg	1
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Cadmium	0.5		mg/kg	0.5
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Chromium	0.83	J	mg/kg	0.5
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Copper	12.4		mg/kg	1
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Lead	19.2		mg/kg	2.5
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Mercury	23.1		mg/kg	0.3
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Nickel	0.06	U	mg/kg	0.1
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Selenium	10.6	J	mg/kg	4
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Silver	0.30	J	mg/kg	0.5
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Thallium	3	J	mg/kg	1
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M		Zinc	0.40	J	mg/kg	1
SS1	C-2	0-2	IN	SURFACE SOIL SAMPLE	M			179	J	mg/kg	2
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	V		Antimony	ND	NA	ug/kg	NA
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	SV		Arsenic	1.7	J	mg/kg	6
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Beryllium	10.0	J	mg/kg	1
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Cadmium	0.41		mg/kg	0.5
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Chromium	0.6	J	mg/kg	0.5
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Copper	10.3		mg/kg	1
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Lead	27.2		mg/kg	2.5
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Mercury	20.8		mg/kg	0.3
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Nickel	0.05	U	mg/kg	0.1
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Selenium	15.5	J	mg/kg	4
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Silver	0.5	J	mg/kg	0.5
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Thallium	0.50	U	mg/kg	1
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M		Zinc	0.5	U	mg/kg	1
SS2	E-2	0-2	OUT	SURFACE SOIL SAMPLE	M			109	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						NOT ANALYZED	Phenanthrene	Fluoranthene				
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	V				110	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				210	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				170	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				04	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				150	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				150	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				170	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				04	J	ug/kg	300
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				2	J	mg/kg	6
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				12.4	J	mg/kg	1
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.45		mg/kg	0.5
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				1		mg/kg	0.5
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				12	J	mg/kg	1
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				49.2		mg/kg	2.5
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				30.6		mg/kg	0.3
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.05	U	mg/kg	0.1
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				14.9		mg/kg	4
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.49	J	mg/kg	0.5
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.67	U	mg/kg	1
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.49	U	mg/kg	1
SS3	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				162	J	mg/kg	2
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	V							
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	SV				70	J	ug/kg	360
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				3.3	J	mg/kg	6
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				7.5	J	mg/kg	1
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.2		mg/kg	0.5
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				2.2		mg/kg	0.5
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				12	J	mg/kg	1
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				24		mg/kg	2.5
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				80.5		mg/kg	0.3
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.05	U	mg/kg	0.1
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.5		mg/kg	4
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.4	J	mg/kg	0.5
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.57	U	mg/kg	1
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				0.4	J	mg/kg	1
SS4	E-1	0-2	OUT	SURFACE SOIL SAMPLE	M				129	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						NOT ANALYZED	FOR				
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	V	Fluoranthene		100	J	ug/kg	350
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene		80	J	ug/kg	350
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene		76	J	ug/kg	350
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		87	J	ug/kg	350
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony		2	J	mg/kg	6
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic		19.5	J	mg/kg	1
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium		0.89		mg/kg	0.5
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium		0.74		mg/kg	0.5
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium		15.4	J	mg/kg	1
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper		32.2		mg/kg	2.5
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead		39.0		mg/kg	0.3
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury		0.06	U	mg/kg	0.1
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel		24.1		mg/kg	4
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium		0.43	J	mg/kg	0.5
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver		0.55	U	mg/kg	1
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium		0.43	J	mg/kg	1
SS5	E-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc		199	J	mg/kg	2
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	V	Fluoranthene		76	J	ug/kg	350
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Anthracene		76	J	ug/kg	350
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene		100	J	ug/kg	350
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene		190	J	ug/kg	350
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		160	J	ug/kg	350
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony		1.0	J	mg/kg	6
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic		16.2	J	mg/kg	1
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium		0.40		mg/kg	0.5
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium		0.9		mg/kg	0.5
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium		14.8	J	mg/kg	1
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper		53.0		mg/kg	2.5
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead		104		mg/kg	0.3
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury		0.05	U	mg/kg	0.1
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel		20.7		mg/kg	4
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium		0.41	J	mg/kg	0.5
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver		0.6	U	mg/kg	1
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium		0.41	J	mg/kg	1
SS6	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc		522	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						V	SV				
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				NOT ANALYZED	NA	ug/kg	NA
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				ALL SEM-VOLATILES	J	mg/kg	6
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Antimony	J	mg/kg	1
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Arsenic		mg/kg	0.5
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Beryllium		mg/kg	0.5
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Cadmium		mg/kg	0.5
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Chromium	J	mg/kg	1
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Copper		mg/kg	2.5
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Lead		mg/kg	0.3
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Mercury	U	mg/kg	0.1
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Nickel		mg/kg	4
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Selenium	J	mg/kg	0.5
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Silver	U	mg/kg	1
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Thallium	J	mg/kg	1
SS7	E-5	0-2	OUT	SURFACE SOIL SAMPLE				Zinc	J	mg/kg	2
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				NOT ANALYZED		ug/kg	350
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Fluoranthene	J	ug/kg	350
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Pyrene	J	ug/kg	350
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Antimony	J	mg/kg	6
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Arsenic	J	mg/kg	1
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Beryllium		mg/kg	0.5
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Cadmium		mg/kg	0.5
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Chromium	J	mg/kg	1
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Copper		mg/kg	2.5
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Lead		mg/kg	0.3
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Mercury	U	mg/kg	0.1
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Nickel		mg/kg	4
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Selenium	J	mg/kg	0.5
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Silver	U	mg/kg	1
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Thallium	J	mg/kg	1
SS0	E-3	0-2	OUT	SURFACE SOIL SAMPLE				Zinc	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	ANALYSIS			DETECTION		
					CATEGORY	FOR	RESULTS	QUAUFIER	UNITS	LIMIT
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	V	NOT ANALYZED				
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Phenanthrene	310	J	ug/kg	350
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene	300	J	ug/kg	350
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene	430	J	ug/kg	350
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	280	J	ug/kg	350
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene	330	J	ug/kg	350
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	520	J	ug/kg	350
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony	1.8	J	mg/kg	6
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic	15.8	J	mg/kg	1
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium	0.60		mg/kg	0.5
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium	1.7		mg/kg	0.5
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium	14.9	J	mg/kg	1
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper	32.3		mg/kg	2.5
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead	89.7		mg/kg	0.3
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury	0.05	U	mg/kg	0.1
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel	27.8		mg/kg	4
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium	0.43	J	mg/kg	0.5
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver	0.8	U	mg/kg	1
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium	0.43	J	mg/kg	1
SS9	F-3	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc	441	J	mg/kg	2

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS		QUALIFIER		DETECTION LIMIT	
						NOT ANALYZED	FOR					UNITS	LIMIT
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	V	Phenanthrene		120		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Fluoranthene		220		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Pyrene		100		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene		06		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Chrysene		140		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		150		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene		81		J		ug/kg	300
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Antimony		1.9		J		mg/kg	6
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Arsenic		17.4		J		mg/kg	1
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Beryllium		0.71				mg/kg	0.5
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Cadmium		1.1				mg/kg	0.5
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Chromium		10.5		J		mg/kg	1
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Copper		34.1				mg/kg	2.5
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Lead		50.2				mg/kg	0.3
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Mercury		0.05		U		mg/kg	0.1
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Nickel		31.0				mg/kg	4
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Selenium		0.47		J		mg/kg	0.5
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Silver		0.64		U		mg/kg	1
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Thallium		0.47		J		mg/kg	1
SS10	E-4	0-2	OUT	SURFACE SOIL SAMPLE	M	Zinc		274		J		mg/kg	2
HB1-SS1	C-3	0-2	IN	HAND BORING	V	Methylene Chloride		82000		A		ug/kg	5
HB1-SS1	C-3	0-2	IN	HAND BORING	V	o-Xylene		440000		I		ug/kg	5
HB1-SS1	C-3	0-2	IN	HAND BORING	SV	2-Methylanthracene		1100		N		ug/kg	300
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Antimony		ND				mg/kg	6
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Arsenic		15				mg/kg	0.5
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Beryllium		0.70		G		mg/kg	0.1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Cadmium		4				mg/kg	1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Chromium		16.3				mg/kg	1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Copper		19.7				mg/kg	1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Lead		15.7				mg/kg	5
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Mercury		ND				mg/kg	0.1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Nickel		21.7				mg/kg	1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Selenium		ND		W		mg/kg	0.5
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Silver		ND				mg/kg	1
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Thallium		ND				mg/kg	10
HB1-SS1	C-3	0-2	IN	HAND BORING	M	Zinc		72.5				mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ANALYSIS	FOR				
HB1-SS2	C-3	0-2	IN	HAND BORING	V	Methylene Chloride		30000	A	ug/kg	5
HB1-SS2	C-3	0-2	IN	HAND BORING	V	o-Xylene		300000	I	ug/kg	5
HB1-SS2	C-3	0-2	IN	HAND BORING	SV	Naphthalene		390		ug/kg	330
HB1-SS2	C-3	0-2	IN	HAND BORING	SV	2-Methylnaphthalene		960		ug/kg	330
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Antimony		ND		mg/kg	6
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Arsenic		11.5		mg/kg	0.5
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Beryllium		ND		mg/kg	0.1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Cadmium		ND		mg/kg	1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Chromium		18.2		mg/kg	1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Copper		21.9		mg/kg	1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Lead		10		mg/kg	5
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Mercury		ND		mg/kg	0.1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Nickel		27.0		mg/kg	1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Selenium		ND		mg/kg	0.5
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Silver		ND		mg/kg	1
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Thallium		ND		mg/kg	10
HB1-SS2	C-3	0-2	IN	HAND BORING	M	Zinc		82.1		mg/kg	1
HB1-SS3	C-3	3-5	IN	HAND BORING	V	Ethylbenzene		120000	g	ug/kg	5
HB1-SS3	C-3	3-5	IN	HAND BORING	V	Methylene Chloride		130000	A	ug/kg	5
HB1-SS3	C-3	3-5	IN	HAND BORING	V	o-Xylene		1900000	g	ug/kg	5
HB1-SS3	C-3	3-5	IN	HAND BORING	SV	Di-n-butyl Phthalate		600		ug/kg	330
HB1-SS3	C-3	3-5	IN	HAND BORING	SV	Naphthalene		1600		ug/kg	330
HB1-SS3	C-3	3-5	IN	HAND BORING	SV	2-Methylnaphthalene		2000		ug/kg	330
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Antimony		ND		mg/kg	6
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Arsenic		17.6		mg/kg	0.5
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Beryllium		0.04		mg/kg	0.1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Cadmium		6.9	G	mg/kg	1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Chromium		10.4		mg/kg	1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Copper		22.7		mg/kg	1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Lead		10		mg/kg	5
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Mercury		ND		mg/kg	0.1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Nickel		25.3		mg/kg	1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Selenium		ND		mg/kg	0.5
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Silver		ND		mg/kg	1
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Thallium		ND		mg/kg	10
HB1-SS3	C-3	3-5	IN	HAND BORING	M	Zinc		83.3		mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			RESULTS			DETECTION	
						V	ALL VOLATILES	NA	UNITS	QUALIFIER	UNITS	UNIT	UNIT
HB2+J-SS1	C-6	0-2	IN	HAND BORING		SV	Naphthalene	ND	ug/kg		ug/kg	NA	330
HB2+J-SS1	C-6	0-2	IN	HAND BORING		SV	2-Methylnaphthalene	870	ug/kg		ug/kg	330	330
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Anthimony	1900	mg/kg		mg/kg	6	6
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Arsenic	12	mg/kg		mg/kg	0.5	0.5
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Beryllium	ND	mg/kg		mg/kg	1	1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Cadmium	ND	mg/kg		mg/kg	1	1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Chromium	14.1	mg/kg		mg/kg	1	1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Copper	19.5	mg/kg		mg/kg	1	1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Lead	27	mg/kg		mg/kg	5	5
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Mercury	ND	mg/kg		mg/kg	0.1	0.1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Nickel	21.4	mg/kg		mg/kg	1	1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Selenium	ND	mg/kg		mg/kg	0.5	0.5
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Silver	ND	mg/kg		mg/kg	1	1
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Thallium	ND	mg/kg		mg/kg	10	10
HB2+J-SS1	C-6	0-2	IN	HAND BORING		M	Zinc	86.1	mg/kg		mg/kg	1	1
HB2-SS2	C-6	0-2	IN	HAND BORING		V	o-Xylene	43	ug/kg		ug/kg	5	5
HB2-SS2	C-6	0-2	IN	HAND BORING		SV	Di-n-butyl Phthalate	3900	ug/kg		ug/kg	330	330
HB2-SS2	C-6	0-2	IN	HAND BORING		SV	Naphthalene	5400	ug/kg		ug/kg	330	330
HB2-SS2	C-6	0-2	IN	HAND BORING		SV	Phenanthrene	5600	ug/kg		ug/kg	330	330
HB2-SS2	C-6	0-2	IN	HAND BORING		SV	2-Methylnaphthalene	23000	ug/kg		ug/kg	330	330
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Anthimony	ND	mg/kg		mg/kg	6	6
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Arsenic	10.5	mg/kg		mg/kg	0.5	0.5
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Beryllium	0.01	mg/kg		mg/kg	0.1	0.1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Cadmium	8.2	mg/kg		mg/kg	1	1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Chromium	17.7	mg/kg		mg/kg	1	1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Copper	24.4	mg/kg		mg/kg	1	1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Lead	9.0	mg/kg		mg/kg	5	5
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Mercury	ND	mg/kg		mg/kg	0.1	0.1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Nickel	20.0	mg/kg		mg/kg	1	1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Selenium	ND	mg/kg		mg/kg	0.5	0.5
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Silver	ND	mg/kg		mg/kg	1	1
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Thallium	ND	mg/kg		mg/kg	10	10
HB2-SS2	C-6	0-2	IN	HAND BORING		M	Zinc	85.5	mg/kg		mg/kg	1	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						ALL VOLATILES	DI-n-butyl Phthalate				ug/kg	NA
HB2-SS3	C-6	3-5	IN	HAND BORING	V	SV	2900	ND	NA	ug/kg	NA	NA
HB2-SS3	C-6	3-5	IN	HAND BORING	SV	SV	400	ND	NA	ug/kg	330	330
HB2-SS3	C-6	3-5	IN	HAND BORING	SV	SV	570	ND	NA	ug/kg	330	330
HB2-SS3	C-6	3-5	IN	HAND BORING	SV	SV	700	ND	NA	ug/kg	330	330
HB2-SS3	C-6	3-5	IN	HAND BORING	SV	SV	2000	ND	NA	ug/kg	330	330
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	11.4	ND	NA	mg/kg	6	6
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	0.5	0.5
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	0.1	0.1
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	10.1	ND	NA	mg/kg	1	1
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	10.2	ND	NA	mg/kg	1	1
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	0.2	ND	NA	mg/kg	5	5
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	0.1	0.1
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	25	ND	NA	mg/kg	1	1
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	0.5	0.5
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	1	1
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	10	10
HB2-SS3	C-6	3-5	IN	HAND BORING	M	M	73.4	ND	NA	mg/kg	1	1
HB4-SS1	B-3	0-2	IN	HAND BORING	V	SV	ND	ND	NA	ug/kg	NA	NA
HB4-SS1	B-3	0-2	IN	HAND BORING	SV	SV	530	ND	NA	ug/kg	330	330
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	6	6
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	7.9	ND	NA	mg/kg	0.5	0.5
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	0.4	ND	NA	mg/kg	0.1	0.1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	1	1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	10	ND	NA	mg/kg	1	1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	26	ND	NA	mg/kg	1	1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	27	ND	NA	mg/kg	5	5
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	0.1	0.1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	23	ND	NA	mg/kg	1	1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	0.5	0.5
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	1	1
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	ND	ND	NA	mg/kg	10	10
HB4-SS1	B-3	0-2	IN	HAND BORING	M	M	109	ND	NA	mg/kg	1	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA
ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ALL VOLATILES	ALL SEMI-VOLATILES				
HB4-SS2	B-3	0-2	IN	HAND BORING	V		ALL VOLATILES	ND	NA	ug/kg	NA
HB4-SS2	B-3	0-2	IN	HAND BORING	SV		Antimony	ND	NA	ug/kg	NA
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Arsenic	ND	N	mg/kg	0
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Beryllium	42	N	mg/kg	0.5
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Cadmium	0.9	*	mg/kg	0.1
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Chromium	ND	G	mg/kg	1
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Copper	15		mg/kg	1
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Lead	38	*	mg/kg	5
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Mercury	20	u	mg/kg	0.1
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Nickel	ND	*	mg/kg	1
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Selenium	60	N	mg/kg	0.5
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Silver	ND	N	mg/kg	1
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Thallium	ND	N	mg/kg	10
HB4-SS2	B-3	0-2	IN	HAND BORING	M		Zinc	131		mg/kg	1
HB4-SS3	B-3	3-5	IN	HAND BORING	V		ALL VOLATILES	ND	NA	ug/kg	NA
HB4-SS3	B-3	3-5	IN	HAND BORING	SV		ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Antimony	ND	N	mg/kg	6
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Arsenic	29	N	mg/kg	0.5
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Beryllium	0.6	*	mg/kg	0.1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Cadmium	ND		mg/kg	1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Chromium	12	G	mg/kg	1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Copper	35	*	mg/kg	1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Lead	18	u	mg/kg	5
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Mercury	ND	*	mg/kg	0.1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Nickel	41	*	mg/kg	1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Selenium	ND	N	mg/kg	0.5
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Silver	ND	N	mg/kg	1
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Thallium	ND	N	mg/kg	10
HB4-SS3	B-3	3-5	IN	HAND BORING	M		Zinc	100		mg/kg	1

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS FOR					RESULTS		QUALIFIER		UNITS		DETECTION LIMIT	
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	FOR	ALL VOLATILES	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
H05-SS1	C-4	0-2	IN	HAND BORING	V		ALL VOLATILES		ND	NA	ug/kg	NA
H05-SS1	C-4	0-2	IN	HAND BORING	SV		ALL SEMI-VOLATILES		ND	NA	ug/kg	NA
H05-SS1	C-4	0-2	IN	HAND BORING	M		Antimony		ND	N	mg/kg	6
H05-SS1	C-4	0-2	IN	HAND BORING	M		Arsenic		0.4		mg/kg	0.5
H05-SS1	C-4	0-2	IN	HAND BORING	M		Beryllium		0.5		mg/kg	0.1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Cadmium		ND		mg/kg	1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Chromium		10		mg/kg	1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Copper		23		mg/kg	1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Lead		19	*	mg/kg	5
H05-SS1	C-4	0-2	IN	HAND BORING	M		Mercury		ND	u	mg/kg	0.1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Nickel		25		mg/kg	1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Selenium		ND	N	mg/kg	0.5
H05-SS1	C-4	0-2	IN	HAND BORING	M		Silver		ND		mg/kg	1
H05-SS1	C-4	0-2	IN	HAND BORING	M		Thallium		ND		mg/kg	10
H05-SS1	C-4	0-2	IN	HAND BORING	M		Zinc		83	N	mg/kg	1
H06-SS1	D-5	0-2	IN	HAND BORING	V		ALL VOLATILES		ND	NA	ug/kg	NA
H06-SS1	D-5	0-2	IN	HAND BORING	SV		ALL SEMI-VOLATILES		ND	NA	ug/kg	NA
H06-SS1	D-5	0-2	IN	HAND BORING	M		Antimony		ND	N	mg/kg	0
H06-SS1	D-5	0-2	IN	HAND BORING	M		Arsenic		4.1		mg/kg	0.5
H06-SS1	D-5	0-2	IN	HAND BORING	M		Beryllium		0.5		mg/kg	0.1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Cadmium		ND		mg/kg	1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Chromium		10		mg/kg	1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Copper		22		mg/kg	1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Lead		11	*	mg/kg	5
H06-SS1	D-5	0-2	IN	HAND BORING	M		Mercury		ND	u	mg/kg	0.1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Nickel		18		mg/kg	1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Selenium		ND	N	mg/kg	0.5
H06-SS1	D-5	0-2	IN	HAND BORING	M		Silver		ND		mg/kg	1
H06-SS1	D-5	0-2	IN	HAND BORING	M		Thallium		ND		mg/kg	10
H06-SS1	D-5	0-2	IN	HAND BORING	M		Zinc		79	N	mg/kg	1

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUAUFIER	UNITS	DETECTION LIMIT
HB6-SS2	D-5	0-2	IN	HAND BORING	V	ALL VOLATILES	ND	NA	ug/kg	NA
HB6-SS2	D-5	0-2	IN	HAND BORING	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Antimony	ND	N	mg/kg	0
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Arsenic	15		mg/kg	0.5
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Beryllium	0.5		mg/kg	0.1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Cadmium	ND		mg/kg	1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Chromium	12		mg/kg	1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Copper	32		mg/kg	1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Lead	10		mg/kg	5
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Mercury	ND	*	mg/kg	0.1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Nickel	25	.u	mg/kg	1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Selenium	ND	N	mg/kg	0.5
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Silver	ND		mg/kg	1
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Thallium	ND		mg/kg	10
HB6-SS2	D-5	0-2	IN	HAND BORING	M	Zinc	86	N	mg/kg	1
HB6-SS3	D-5	3-5	IN	HAND BORING	V	ALL VOLATILES	ND	NA	ug/kg	NA
HB6-SS3	D-5	3-5	IN	HAND BORING	SV	ALL SEMI-VOLATILES	ND	NA	ug/kg	NA
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Antimony	ND	N	mg/kg	6
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Arsenic	13		mg/kg	0.5
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Beryllium	0.6		mg/kg	0.1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Cadmium	ND		mg/kg	1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Chromium	14		mg/kg	1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Copper	25		mg/kg	1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Lead	15	*	mg/kg	5
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Mercury	ND	u	mg/kg	0.1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Nickel	25		mg/kg	1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Selenium	ND	N	mg/kg	0.5
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Silver	ND		mg/kg	1
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Thallium	ND		mg/kg	10
HB6-SS3	D-5	3-5	IN	HAND BORING	M	Zinc	92	N	mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW1-SS1	C-6	13-15	IN	MONITORING WELL	V	Ethylbenzene	1700		ug/kg	5
MW1-SS1	C-6	13-15	IN	MONITORING WELL	V	o-Xylene	1600	NA	ug/kg	5
MW1-SS1	C-6	13-15	IN	MONITORING WELL	SV	ALL SEMI-VOLATILES	ND		ug/kg	NA
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Antimony	ND	N	mg/kg	6
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Arsenic	7.0	N	mg/kg	0.5
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Borilium	ND	N	mg/kg	0.1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Cadmium	ND	N	mg/kg	1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Chromium	4.5	B	mg/kg	1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Copper	12.7	N	mg/kg	1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Lead	ND	N	mg/kg	5
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Mercury	DNU		mg/kg	0.1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Nickel	13.3	N	mg/kg	1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Selenium	ND	W	mg/kg	0.5
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Silver	ND	N	mg/kg	1
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Thallium	ND	N	mg/kg	10
MW1-SS1	C-6	13-15	IN	MONITORING WELL	M	Zinc	56.1	N	mg/kg	1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	V	Benzene	1900		ug/kg	5
MW1-SS2	C-6	14-16	IN	MONITORING WELL	V	Ethylbenzene	11000		ug/kg	5
MW1-SS2	C-6	14-16	IN	MONITORING WELL	V	o-Xylene	20000		ug/kg	5
MW1-SS2	C-6	14-16	IN	MONITORING WELL	SV	Naphthalene	630		ug/kg	330
MW1-SS2	C-6	14-16	IN	MONITORING WELL	SV	2-Methylnaphthalene	1200		ug/kg	330
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Antimony	ND	N	mg/kg	6
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Arsenic	10.9	N	mg/kg	0.5
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Borilium	ND	N	mg/kg	0.1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Cadmium	ND	N	mg/kg	1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Chromium	8.4	N	mg/kg	1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Copper	17.2	N	mg/kg	1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Lead	8.6	B	mg/kg	5
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Mercury	DNU		mg/kg	0.1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Nickel	22.2	N	mg/kg	1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Selenium	ND	W	mg/kg	0.5
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Silver	ND	N	mg/kg	1
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Thallium	ND	N	mg/kg	10
MW1-SS2	C-6	14-16	IN	MONITORING WELL	M	Zinc	63.0		mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR			RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						V	ALL SEMI-VOLATILES	ALL VOLATILES				
MW2-SS1	B-7	0-2	OUT	MONITORING WELL				Antimony	ND	NA	ug/kg	NA
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		SV		Antimony	ND	NA	ug/kg	NA
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Arsenic	ND	N	mg/kg	6
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Beryllium	15	N	mg/kg	0.5
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Cadmium	ND		mg/kg	0.1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Chromium	ND		mg/kg	1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Copper	15		mg/kg	1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Lead	21		mg/kg	1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Mercury	17		mg/kg	5
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Nickel	ND		mg/kg	0.1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Selenium	25		mg/kg	1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Silver	ND	N	mg/kg	0.5
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Thallium	ND		mg/kg	1
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M		Zinc	66	N	mg/kg	10
MW2-SS1	B-7	0-2	OUT	MONITORING WELL		M					mg/kg	1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		V		Methylene Chloride	5		ug/kg	5
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		SV		Antimony	ND	NA	ug/kg	NA
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Arsenic	ND	N	mg/kg	6
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Beryllium	7.6	N	mg/kg	0.5
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Cadmium	0.2	B	mg/kg	0.1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Chromium	ND		mg/kg	1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Copper	12		mg/kg	1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Lead	21		mg/kg	1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Mercury	31		mg/kg	5
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Nickel	ND		mg/kg	0.1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Selenium	21		mg/kg	1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Silver	ND	N	mg/kg	0.5
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Thallium	ND		mg/kg	1
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M		Zinc	74		mg/kg	10
MW2-SS2	B-7	0-2	OUT	MONITORING WELL		M				N	mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	V	Methylene Chloride	5	NA		ug/kg	5	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	SV	ALL SEMI-VOLATILES	ND			ug/kg	NA	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Antimony	ND	N		mg/kg	6	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Arsenic	8.6	N		mg/kg	0.5	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Beryllium	ND			mg/kg	0.1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Cadmium	ND			mg/kg	1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Chromium	8			mg/kg	1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Copper	24			mg/kg	1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Lead	28			mg/kg	5	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Mercury	ND			mg/kg	0.1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Nickel	9.2	B		mg/kg	1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Selenium	ND	N		mg/kg	0.5	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Silver	ND			mg/kg	1	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Thallium	ND			mg/kg	10	
MW2-SS3	B-7	3-5	OUT	MONITORING WELL	M	Zinc	76	N		mg/kg	1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	SV	ALL SEMI-VOLATILES	ND	NA		ug/kg	NA	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Antimony	ND	N		mg/kg	6	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Arsenic	15.3			mg/kg	0.5	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Beryllium	ND	N		mg/kg	0.1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Cadmium	ND			mg/kg	1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Chromium	13.1			mg/kg	1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Copper	20.5			mg/kg	1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Lead	15.6			mg/kg	5	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Mercury	ND			mg/kg	0.1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Nickel	24.1			mg/kg	1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Selenium	ND	W		mg/kg	0.5	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Silver	ND	N		mg/kg	1	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Thallium	ND			mg/kg	10	
MW3-SS1	C-4	0-2	IN	MONITORING WELL	M	Zinc	87.1			mg/kg	1	

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						ALL SEMI-VOLATILES	Antimony				ug/kg	NA
MW3-SS2	C-4	0-10	IN	MONITORING WELL	SV	Antimony	ND	ND	NA	ug/kg	NA	NA
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Arsenic	ND	ND	N	mg/kg	6	0.5
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Beryllium	10.1	ND	N	mg/kg	0.1	0.1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Cadmium	ND	ND	N	mg/kg	1	1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Chromium	14.1	ND	N	mg/kg	1	1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Copper	19.1	ND	N	mg/kg	1	1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Lead	13.7	ND	N	mg/kg	5	5
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Mercury	ND	ND	N	mg/kg	0.1	0.1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Nickel	24.9	ND	N	mg/kg	1	1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Selenium	ND	ND	N	mg/kg	0.5	0.5
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Silver	ND	ND	N	mg/kg	1	1
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Thallium	10.5	ND	N	mg/kg	10	10
MW3-SS2	C-4	0-10	IN	MONITORING WELL	M	Zinc	83.7	ND	N	mg/kg	1	1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	500	500		ug/kg	330	330
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	420	420	N	ug/kg	330	330
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	ND	ND	N	mg/kg	6	6
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	14.1	ND	N	mg/kg	0.5	0.5
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.79	ND	G	mg/kg	0.1	0.1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	6.3	ND	N	mg/kg	1	1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	22.1	ND	N	mg/kg	1	1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	29.3	ND	N	mg/kg	1	1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	41.9	ND	N	mg/kg	5	5
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	ND	ND	N	mg/kg	0.1	0.1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	20.2	ND	N	mg/kg	1	1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	ND	ND	W	mg/kg	0.5	0.5
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	ND	ND	N	mg/kg	1	1
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	ND	ND	N	mg/kg	10	10
SU1+2-GS1	B-2,C-2	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	422	422	N	mg/kg	1	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

ANALYSIS						DETECTION				
SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	FOR	RESULTS	QUALIFIER	UNITS	LIMIT
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	500		ug/kg	330
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	570	N	ug/kg	330
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	ND		mg/kg	6
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	19.7		mg/kg	0.5
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.8		mg/kg	0.1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.3	G	mg/kg	1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	22.4		mg/kg	1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	28.1		mg/kg	1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	35.3		mg/kg	5
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	ND		mg/kg	0.1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	28.3		mg/kg	1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	ND		mg/kg	0.5
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	ND		mg/kg	1
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	ND		mg/kg	10
SU3+4-GS1	D-2,D-3	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	134		mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Anthracene	500		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Anthracene	2100		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	2600		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	3200		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(g,h,i)Perylene	1700		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	2000		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Bis(2-ethylhexyl)Phthalate	4100		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene	2000		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Dibenz(a,h)Anthracene	360		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	4100		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Indeno(1,2,3-cd)Pyrene	1700		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene	4200		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	5600		ug/kg	330
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	ND	N	mg/kg	6
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	17.7	S	mg/kg	0.5
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.75		mg/kg	0.1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	0.9	G	mg/kg	1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	25.6		mg/kg	1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	57.9		mg/kg	1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	107		mg/kg	5
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	ND		mg/kg	0.1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	18.1		mg/kg	1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	ND	W	mg/kg	0.5
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	ND		mg/kg	1
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	ND		mg/kg	10
SUS+6-GS1	B-3,C-3	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	433		mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						ANALYSIS	FOR				
SU7+8-GS1	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		530		ug/kg	330
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Di-n-butyl Phthalate		940		ug/kg	330
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene		520		ug/kg	330
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	N	ND		mg/kg	6
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic		15.2		mg/kg	0.5
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium		0.9		mg/kg	0.1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	G	6		mg/kg	1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium		22.1		mg/kg	1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Copper		23.1		mg/kg	1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Lead		55.7		mg/kg	5
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury		ND		mg/kg	0.1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel		20.6		mg/kg	1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium		ND		mg/kg	0.5
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Silver		ND		mg/kg	1
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium		ND		mg/kg	10
SU7+8-GS	B-4,C-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc		298		mg/kg	1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene		360		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene		570		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene		300		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene		420		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene		840		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene		410		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene		630		ug/kg	330
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	N	ND		mg/kg	6
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic		17.9		mg/kg	0.5
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium		0.95		mg/kg	0.1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	G	9.1		mg/kg	1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium		20.1		mg/kg	1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Copper		73.1		mg/kg	1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Lead		72.0		mg/kg	5
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury		ND		mg/kg	0.1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel		26.6		mg/kg	1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium		ND		mg/kg	0.5
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Silver		ND		mg/kg	1
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium		ND		mg/kg	10
SU9+10-GS	D-4,E-4	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc		260		mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(a)Pyrene	530		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	050		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(k)Fluoranthene	460		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Bis(2-ethylhexyl)Phthalate	400		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Chrysene	540		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Di-n-butyl Phthalate	6500		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluorene	1400		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Phenanthrene	1100		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Pyrene	1000		ug/kg	330
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	ND	N	mg/kg	6
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	17.7		mg/kg	0.5
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.70		mg/kg	0.1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	8	G	mg/kg	1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	19.5		mg/kg	1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	29.7		mg/kg	1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	35		mg/kg	5
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	ND		mg/kg	0.1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	26.5		mg/kg	1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	ND	S	mg/kg	0.5
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	ND		mg/kg	1
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	ND		mg/kg	10
SU11+12-GS	C-5,D-5	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	113		mg/kg	1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Benzo(b)Fluoranthene	430		ug/kg	330
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	SV	Fluoranthene	440		ug/kg	330
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Antimony	ND	N	mg/kg	6
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Arsenic	12.8		mg/kg	0.5
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Beryllium	0.89		mg/kg	0.1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Cadmium	7.7	G	mg/kg	1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Chromium	19.6		mg/kg	1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Copper	19.7		mg/kg	1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Lead	41.5		mg/kg	5
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Mercury	ND		mg/kg	0.1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Nickel	14.8		mg/kg	1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Selenium	ND		mg/kg	0.5
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Silver	ND		mg/kg	1
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Thallium	ND		mg/kg	10
SU13+14-GS	B-6,C-5	0-2	IN	SURFACE SOIL SAMPLE	M	Zinc	120		mg/kg	1

RICKENBACKER ANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - SOIL

SAMPLE #	GRID #	DEPTH	IN/OUT	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT	
						Benzo(b)Fluoranthene	Fluoranthene					
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	SV			840		ug/kg	330	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	SV			740		ug/kg	330	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	SV		Pyrene	520	N	ug/kg	330	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Anthimony	ND		mg/kg	6	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Arsenic	17.2		mg/kg	0.5	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Borillium	0.75		mg/kg	0.1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Cadmium	7.7	G	mg/kg	1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Chromium	23.9		mg/kg	1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Copper	30.7		mg/kg	1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Lead	52.1		mg/kg	5	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Mercury	ND		mg/kg	0.1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Nickel	26.4		mg/kg	1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Selenium	ND	W	mg/kg	0.5	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Silver	ND		mg/kg	1	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Thallium	ND		mg/kg	10	
SU15+16-GS	C-6,D-6	0-2	IN	SURFACE SOIL SAMPLE	M		Zinc	135		mg/kg	1	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #			YES/NO GRID # FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	V	ALL SEMI-VOLATILES	Benzene	94		U	ug/L	5
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	V		Acetone	120		NA	ug/L	100
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	SV		o-Xylene	ND			ug/L	NA
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	V		Antimony	20			ug/L	5
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Arsenic	ND			mg/L	0.06
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Beryllium	0.34		N	mg/L	0.005
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Cadmium	ND			mg/L	0.001
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Chromium	0.15			mg/L	0.01
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Copper	0.52			mg/L	0.01
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Lead	0.88			mg/L	0.01
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Mercury	0.82			mg/L	0.005
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Nickel	0.0003			mg/L	0.0002
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Selenium	0.84		T	mg/L	0.01
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Silver	ND		N	mg/L	0.005
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Thallium	ND			mg/L	0.01
MW1-GW1	C-6		19-Sep-88	Groundwater Sample	M		Zinc	3.6			mg/L	0.01
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	V	2-Methylnaphthalene	Benzene	34			ug/L	5
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	SV		Antimony	13			ug/L	10
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Arsenic	ND			mg/L	0.06
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Beryllium	0.4		N	mg/L	0.005
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Cadmium	ND			mg/L	0.001
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Chromium	0.18			mg/L	0.01
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Copper	0.66			mg/L	0.01
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Lead	1.1			mg/L	0.01
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Mercury	0.99			mg/L	0.005
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Nickel	0.0003			mg/L	0.0002
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Selenium	1		T	mg/L	0.01
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Silver	ND		N	mg/L	0.005
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Thallium	ND			mg/L	0.01
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M		Zinc	4.3			mg/L	0.1
MW1-GW1D	C-6		19-Sep-88	Groundwater Sample	M						mg/L	0.01

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS		QUALIFIER	UNITS	DETECTION LIMIT
							NA	ND			
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	V	ALL VOLATILES	NA	ND	NA	ug/L	NA
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	SV	ALL SEMI-VOLATILES	NA	ND	NA	ug/L	NA
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Antimony		ND		mg/L	0.06
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Arsenic	N	0.184		mg/L	0.005
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Beryllium		ND		mg/L	0.001
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Cadmium		0.12		mg/L	0.01
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Chromium		0.28		mg/L	0.01
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Copper		0.66		mg/L	0.01
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Lead		0.55		mg/L	0.005
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Mercury		0.0002		mg/L	0.0002
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Nickel	Y	0.45		mg/L	0.01
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Selenium		ND		mg/L	0.005
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Silver	N	ND		mg/L	0.01
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Thallium		ND		mg/L	0.1
MW2-GW1	B-7		19-Sep-88	Groundwater Sample	M	Zinc		2.4		mg/L	0.01
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	V	Trichloroethylene	NA	44		ug/L	5
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	SV	ALL SEMI-VOLATILES	NA	ND		ug/L	NA
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Antimony		ND		mg/L	0.06
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Arsenic	N	0.14		mg/L	0.005
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Beryllium		ND		mg/L	0.001
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Cadmium		0.04		mg/L	0.01
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Chromium		0.16		mg/L	0.01
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Copper		0.2		mg/L	0.01
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Lead		0.19		mg/L	0.005
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Mercury		ND		mg/L	0.0002
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Nickel		0.27		mg/L	0.01
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Selenium	S	0.0082		mg/L	0.005
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Silver	N	ND		mg/L	0.01
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Thallium		ND		mg/L	0.1
MW3-GW1	C-4		22-Sep-88	Groundwater Sample	M	Zinc		0.94		mg/L	0.01
MW3-GW1	C-4		17-Oct-88	Groundwater Sample	SV	Bis(2-ethylhexyl)phthalat	B	24		ug/L	10

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

YES/NO FILTERED			DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
SAMPLE #	GRID #										
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Antimony		35.3	U	ug/L	60
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Arsenic		9.5	B	ug/L	10
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Beryllium		3.9	U	ug/L	5
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Cadmium		4.9	U	ug/L	5
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Chromium		70.4		ug/L	10
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Copper		171		ug/L	25
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Lead		195		ug/L	3
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Mercury		0.1	U	ug/L	0.2
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Nickel		121		ug/L	40
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Selenium		5.5		ug/L	5
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Silver		9.1	U	ug/L	10
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Thallium		0.9	U	ug/L	10
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Zinc		678		ug/L	20
MW1 - GW2	C-6	NO	06-Feb-90	Groundwater Sample	M	Antimony		40.2	U	ug/L	60
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Arsenic		9.4	B	ug/L	10
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Beryllium		2.3	U	ug/L	5
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Cadmium		1.9	U	ug/L	5
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Chromium		8.7	U	ug/L	25
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Copper		4.1	U	ug/L	3
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Lead		7.7	SJ	ug/L	0.2
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Mercury		0.11	B	ug/L	0.2
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Nickel		23.6	U	ug/L	40
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Selenium		1.7	U	ug/L	5
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Silver		6.6	U	ug/L	10
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Thallium		0.9	U	ug/L	10
MW1 - GW2	C-6	YES	06-Feb-90	Groundwater Sample	M	Zinc		10	BJ	ug/L	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						FOR					
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Antimony	40.2	U		ug/L	60
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Arsenic	6.5	B		ug/L	10
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Beryllium	2.3	U		ug/L	5
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Cadmium	1.9	U		ug/L	5
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Chromium	33			ug/L	10
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Copper	101			ug/L	25
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Lead	84.5	S		ug/L	3
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Mercury	0.1	U		ug/L	0.2
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Nickel	52			ug/L	40
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Selenium	1.9	BW		ug/L	5
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Silver	6.6	U		ug/L	10
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Thallium	0.9	U		ug/L	10
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Zinc	340			ug/L	20
MW2-GW2	B-7	NO	07-Feb-90	Groundwater Sample	M	Antimony	34.6	U		ug/L	60
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Arsenic	4.2	BW		ug/L	10
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Beryllium	3.8	U		ug/L	5
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Cadmium	4.8	U		ug/L	5
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Chromium	9.8	U		ug/L	10
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Copper	6	U		ug/L	25
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Lead	14	W		ug/L	3
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Mercury	0.1	U		ug/L	0.2
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Nickel	31.1	U		ug/L	40
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Selenium	1.4	U		ug/L	5
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Silver	8.9	U		ug/L	10
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Thallium	0.9	U		ug/L	10
MW2-GW2	B-7	YES	07-Feb-90	Groundwater Sample	M	Zinc	18	BJ		ug/L	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION	
										LIMIT	LIMIT
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Antimony	40.2		U	ug/L	60
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Arsenic	5.9		B	ug/L	10
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Beryllium	2.3		U	ug/L	5
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Cadmium	1.9		U	ug/L	5
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Chromium	8.7		U	ug/L	10
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Copper	7		B	ug/L	25
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Lead	9.7		J	ug/L	3
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Mercury	0.1		U	ug/L	0.2
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Nickel	23.6		U	ug/L	40
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Selenium	1.7		U	ug/L	5
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Silver	6.6		U	ug/L	10
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Thallium	0.9		U	ug/L	10
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Zinc	35		J	ug/L	20
MW3-GW2	C-4	NO	06-Feb-90	Groundwater Sample	M	Antimony	34.6		U	ug/L	60
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Arsenic	2		B	ug/L	10
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Beryllium	3.8		U	ug/L	5
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Cadmium	4.8		U	ug/L	5
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Chromium	9.8		U	ug/L	10
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Copper	6		U	ug/L	25
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Lead	5.3		U	ug/L	3
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Mercury	0.1		U	ug/L	0.2
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Nickel	31.1		U	ug/L	40
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Selenium	1.4		U	ug/L	5
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Silver	8.9		U	ug/L	10
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Thallium	0.9		U	ug/L	10
MW3-GW2	C-4	YES	06-Feb-90	Groundwater Sample	M	Zinc	17		BU	ug/L	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR			DETECTION LIMIT		
						RESULTS	QUALIFIER	UNITS			
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Antimony		ug/L	U	34.6	60
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Arsenic		ug/L	U	18.5	10
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Beryllium		ug/L	U	3.0	5
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Cadmium		ug/L	U	4.8	5
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Chromium		ug/L		39	10
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Copper		ug/L		73	25
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Lead		ug/L	S	27.1	3
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Mercury		ug/L	U	0.1	0.2
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Nickel		ug/L		73	40
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Selenium		ug/L	BW	1.5	5
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Silver		ug/L	U	8.9	10
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Thallium		ug/L	U	0.9	10
MW4 - GW1	B-2	NO	06-Feb-90	Groundwater Sample	M	Zinc		ug/L	U	340	60
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Antimony		ug/L	U	40.2	10
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Arsenic		ug/L	U	1.5	5
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Beryllium		ug/L	U	2.3	5
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Cadmium		ug/L	U	1.9	10
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Chromium		ug/L	U	8.7	25
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Copper		ug/L	U	4.1	3
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Lead		ug/L	U	12.5	0.2
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Mercury		ug/L	U	0.1	40
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Nickel		ug/L	U	23.6	5
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Selenium		ug/L	UW	1.7	10
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Silver		ug/L	U	6.6	10
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Thallium		ug/L	U	0.9	10
MW4 - GW1	B-2	YES	06-Feb-90	Groundwater Sample	M	Zinc		ug/L	BJ	10	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						M					
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Antimony		35.3	U	ug/L	60
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Arsenic		9.2	BW	ug/L	10
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Beryllium		3.9	U	ug/L	5
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Cadmium		4.9	U	ug/L	5
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Chromium		32.6		ug/L	10
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Copper		101		ug/L	25
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Lead		84		ug/L	3
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Mercury		0.1	U	ug/L	0.2
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Nickel		83.6		ug/L	40
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Selenium		13	BW	ug/L	5
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Silver		9.1	U	ug/L	10
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Thallium		0.9	U	ug/L	10
MW6-GW1	E-5	NO	07-Feb-90	Groundwater Sample	M	Zinc		455		ug/L	20
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Antimony		40.2	U	ug/L	60
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Arsenic		1.5	U	ug/L	10
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Beryllium		2.3	U	ug/L	5
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Cadmium		1.9	U	ug/L	5
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Chromium		8.7	U	ug/L	10
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Copper		4.1	U	ug/L	25
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Lead		3.1	J	ug/L	3
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Mercury		0.1	U	ug/L	0.2
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Nickel		23.6	U	ug/L	40
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Selenium		1.7	U	ug/L	5
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Silver		6.6	U	ug/L	10
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Thallium		0.9	U	ug/L	10
MW6-GW1	E-5	YES	07-Feb-90	Groundwater Sample	M	Zinc		5	BJ	ug/L	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Antimony	34.6	U	ug/L	60
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Arsenic	17.9	U	ug/L	10
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Beryllium	3.8	U	ug/L	5
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Cadmium	4.8	U	ug/L	5
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Chromium	27		ug/L	10
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Copper	31		ug/L	25
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Lead	25.8	+	ug/L	3
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Mercury	0.1	U	ug/L	0.2
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Nickel	31.1	U	ug/L	40
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Selenium	1.4	UW	ug/L	5
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Silver	8.9	U	ug/L	10
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Thallium	0.9	U	ug/L	10
MW7-GW1	D-8	NO	07-Feb-90	Groundwater Sample	M		Zinc	168	U	ug/L	20
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Antimony	40.2	U	ug/L	60
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Arsenic	6.9	B	ug/L	10
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Beryllium	2.3	U	ug/L	5
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Cadmium	1.9	U	ug/L	5
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Chromium	8.7	U	ug/L	10
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Copper	4.1	U	ug/L	25
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Lead	4.9	J	ug/L	3
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Mercury	0.1	U	ug/L	0.2
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Nickel	23.6	U	ug/L	40
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Selenium	1.7	U	ug/L	5
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Silver	6.6	U	ug/L	10
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Thallium	0.9	U	ug/L	10
MW7-GW1	D-8	YES	07-Feb-90	Groundwater Sample	M		Zinc	8	BJ	ug/L	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Antimony	40.2	U	ug/L	60
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Arsenic	1.7	BW	ug/L	10
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Beryllium	3	B	ug/L	5
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Cadmium	1.9	U	ug/L	5
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Chromium	65		ug/L	10
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Copper	135		ug/L	25
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Lead	50.1		ug/L	3
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Mercury	0.1	U	ug/L	0.2
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Nickel	134		ug/L	40
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Selenium	1.7	UW	ug/L	5
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Silver	6.6	U	ug/L	10
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Thallium	0.9	U	ug/L	10
MWB-GW1	C-10	NO	07-Feb-90	Groundwater Sample	M		Zinc	642		ug/L	20
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Antimony	34.6	U	ug/L	60
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Arsenic	3.1	BW	ug/L	10
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Beryllium	3.8	U	ug/L	5
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Cadmium	4.8	U	ug/L	5
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Chromium	9.0	U	ug/L	10
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Copper	6	U	ug/L	25
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Lead	6		ug/L	3
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Mercury	0.1	U	ug/L	0.2
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Nickel	31.1	U	ug/L	40
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Selenium	1.4	U	ug/L	5
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Silver	8.9	U	ug/L	10
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Thallium	0.9	U	ug/L	10
MWB-GW1	C-10	YES	07-Feb-90	Groundwater Sample	M		Zinc	21	J	ug/L	20

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						FOR					
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Antimony		40.2	U	ug/L	60
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Arsenic		8.4	BS	ug/L	10
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Beryllium		2.3	B	ug/L	5
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Cadmium		1.9	U	ug/L	5
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Chromium		24		ug/L	10
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Copper		15	B	ug/L	25
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Lead		33.3		ug/L	3
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Mercury		0.1	U	ug/L	0.2
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Nickel		23.6		ug/L	40
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Selenium		1.7	UW	ug/L	5
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Silver		6.6	U	ug/L	10
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Thallium		0.9	U	ug/L	10
MW9-GW1	A-4	NO	16-Feb-90	Groundwater Sample	M	Zinc		62		ug/L	20
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Antimony		40.2	U	ug/L	60
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Arsenic		2	B	ug/L	10
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Beryllium		2.3	U	ug/L	5
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Cadmium		1.9	U	ug/L	5
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Chromium		8.7	U	ug/L	10
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Copper		4.1	U	ug/L	25
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Lead		3.6	J	ug/L	3
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Mercury		0.1	U	ug/L	0.2
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Nickel		23.6	U	ug/L	40
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Selenium		1.7	UW	ug/L	5
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Silver		6.6	U	ug/L	10
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Thallium		0.9	U	ug/L	10
MW9-GW1	A-4	YES	16-Feb-90	Groundwater Sample	M	Zinc		13	BJ	ug/L	20
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	Acetone		100	UJ	ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	2-Butanone		100	U	ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	Vinyl Acetate		50	U	ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	Benzene		560	D	ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	2-Hexanone		50	U	ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	4-Methyl-2-pentanone		50	U	ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	Ethylbenzene		110		ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	m/p-Xylene		35		ug/L	10
MW1-GW2	C-6		06-Feb-90	Groundwater Sample	V	o-Xylene		86		ug/L	10
MW2-GW2	B-7		07-Feb-90	Groundwater Sample	V	Acetone		100	U	ug/L	10
MW2-GW2	B-7		07-Feb-90	Groundwater Sample	V	2-Butanone		100	U	ug/L	10
MW2-GW2	B-7		07-Feb-90	Groundwater Sample	V	Vinyl Acetate		50	U	ug/L	10
MW2-GW2	B-7		07-Feb-90	Groundwater Sample	V	2-Hexanone		50	U	ug/L	10
MW2-GW2	B-7		07-Feb-90	Groundwater Sample	V	4-Methyl-2-pentanone		50	U	ug/L	10

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR			DETECTION LIMIT		
						RESULTS	QUALIFIER	UNITS			
MW3-GW2	C-4		06-Feb-90	Groundwater Sample	V	Acetone		100	U	ug/L	10
MW3-GW2	C-4		06-Feb-90	Groundwater Sample	V	2-Butanone		100	U	ug/L	10
MW3-GW2	C-4		06-Feb-90	Groundwater Sample	V	Vinyl Acetate		50	U	ug/L	10
MW3-GW2	C-4		06-Feb-90	Groundwater Sample	V	Trichloroethene		7	U	ug/L	10
MW3-GW2	C-4		06-Feb-90	Groundwater Sample	V	2-Hexanone		50	U	ug/L	10
MW3-GW2	C-4		06-Feb-90	Groundwater Sample	V	4-Methyl-2-pentanone		50	U	ug/L	10
MW4-GW1	B-2		06-Feb-90	Groundwater Sample	V	Acetone		100	U	ug/L	10
MW4-GW1	B-2		06-Feb-90	Groundwater Sample	V	2-Butanone		100	U	ug/L	10
MW4-GW1	B-2		06-Feb-90	Groundwater Sample	V	Vinyl Acetate		50	U	ug/L	10
MW4-GW1	B-2		06-Feb-90	Groundwater Sample	V	2-Hexanone		50	U	ug/L	10
MW4-GW1	B-2		06-Feb-90	Groundwater Sample	V	4-Methyl-2-pentanone		50	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	Acetone		100	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	Trans-1,2-Dichloroethene		8	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	2-Butanone		100	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	Vinyl Acetate		50	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	Trichloroethene		78	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	2-Hexanone		50	U	ug/L	10
MW5-GW1	E-6		07-Feb-90	Groundwater Sample	V	4-Methyl-2-pentanone		50	U	ug/L	10

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR	RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Chloromethane	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Bromoethane	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Vinyl Chloride	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Chloroethane	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Methylene Chloride	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Acetone	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Arylonitrile	1000	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Carbon Disulfide	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Trichlorofluoromethane	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,1-Dichloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,1-Dichloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Trans-1,2-Dichloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Chloroform	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,2-Dichloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	2-Butanone	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,1,1-Trichloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Carbon Tetrachloride	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Vinyl Acetate	500	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Bromochloromethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,2-Dichloropropane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	cis-1,3-Dichloropropene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Trichloroethene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Benzene	200	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Dibromochloromethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,1,2-Trichloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	trans-1,3-Dichloropropene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	2-Chloroethylvinyl ether	100	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Bromodorm	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	2-Hexanone	500	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	4-Methyl-2-pentanone	500	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Tetrachloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,1,2,2-Tetrachloroethane	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Toluene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Chlorobenzene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Ethylbenzene	90	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	Styrene	21	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	m/p-Xylene	70	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	o-Xylene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,3-Dichlorobenzene	50	U	ug/L	10
MW7-GW1	D-7		07-Feb-90	Groundwater Sample	V	1,2/1,4-Dichlorobenzene	50	U	ug/L	10

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #			GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW8 - GW1	C-10		07 - Feb -90	Groundwater Sample	V	Methylene_Chloride	5	U	ug/L	10			
MW8 - GW1	C-10		07 - Feb -90	Groundwater Sample	V	Acetone	100	U	ug/L	10			
MW8 - GW1	C-10		07 - Feb -90	Groundwater Sample	V	2-Butanone	100	U	ug/L	10			
MW8 - GW1	C-10		07 - Feb -90	Groundwater Sample	V	Vinyl Acetate	50	U	ug/L	10			
MW8 - GW1	C-10		07 - Feb -90	Groundwater Sample	V	2-Hexanone	50	U	ug/L	10			
MW8 - GW1	C-10		07 - Feb -90	Groundwater Sample	V	4-Methyl-2-pentanone	50	U	ug/L	10			
MW9 - GW1	A-4		16 - Feb -90	Groundwater Sample	V	Acetone	100	U	ug/L	10			
MW9 - GW1	A-4		16 - Feb -90	Groundwater Sample	V	2-Butanone	100	U	ug/L	10			
MW9 - GW1	A-4		16 - Feb -90	Groundwater Sample	V	Vinyl Acetate	50	U	ug/L	10			
MW9 - GW1	A-4		16 - Feb -90	Groundwater Sample	V	2-Hexanone	50	U	ug/L	10			
MW9 - GW1	A-4		16 - Feb -90	Groundwater Sample	V	4-Methyl-2-pentanone	50	U	ug/L	10			
D9			07 - Feb -90	Groundwater Sample	V	Methylene_Chloride	5	U	ug/L	10			
D9			07 - Feb -90	Groundwater Sample	V	Acetone	100	U	ug/L	10			
D9			07 - Feb -90	Groundwater Sample	V	2-Butanone	100	U	ug/L	10			
D9			07 - Feb -90	Groundwater Sample	V	Vinyl Acetate	50	U	ug/L	10			
D9			07 - Feb -90	Groundwater Sample	V	2-Hexanone	50	U	ug/L	10			
D9			07 - Feb -90	Groundwater Sample	V	4-Methyl-2-pentanone	50	U	ug/L	10			
MW1 - GW2	C-6		06 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
MW2 - GW2	B-7		07 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
MW3 - GW2	C-4		06 - Feb -90	Groundwater Sample	SV	ALL SEMI-VOLATILES	ND	J	ug/L	NA			
MW4 - GW1	B-2		06 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
MW6 - GW1	E-5		07 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
MW7 - GW1	D-7		07 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
MW7 - GW1	C-10		07 - Feb -90	Groundwater Sample	SV	2-Methylnaphthalene	5	J	ug/L	10			
MW7 - GW1	C-10		07 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
MW9 - GW1	A-4		16 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
D-9			07 - Feb -90	Groundwater Sample	SV	2-Methylnaphthalene	5	J	ug/L	10			
D-9			07 - Feb -90	Groundwater Sample	SV	3,3'-Dichlorobenzidine	20	U	ug/L	10			
D-9	B-7		17 - Oct -91	Groundwater Sample	SV	ALL SEMI-VOLATILES	ND	NA	ug/L	NA			
MW-4	D-2		17 - Oct -91	Groundwater Sample	SV	ALL SEMI-VOLATILES	ND	NA	ug/L	NA			

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR			RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						SV	ALL SEMI-VOLATILES					
MW-6	E-5		17-Oct-91	Groundwater Sample		SV	ALL SEMI-VOLATILES		ND	NA	ug/L	NA
MW-7	D-7		17-Oct-91	Groundwater Sample		SV	Naphthaleno		6	J	ug/L	
MW-7	D-7		17-Oct-91	Groundwater Sample		SV	2-Methylnaphthaleno		2	J	ug/L	
MW-8	A-8		17-Oct-91	Groundwater Sample		SV	ALL SEMI-VOLATILES		ND	NA	ug/L	NA
MW-11	F-7		17-Oct-91	Groundwater Sample		SV	ALL SEMI-VOLATILES		ND	NA	ug/L	NA
MW-11DUP	F-7		17-Oct-91	Groundwater Sample		SV	ALL SEMI-VOLATILES		ND	NA	ug/L	NA
MW-12	E-9		17-Oct-91	Groundwater Sample		SV	ALL SEMI-VOLATILES		ND	NA	ug/L	NA
MW-2	B-7		17-Oct-91	Groundwater Sample		V	1,1,1-Trichloroethano		2	J	ug/L	
MW-3	C-4		17-Oct-91	Groundwater Sample		V	Trichloroethano		10		ug/L	
MW-3R	C-4		17-Oct-91	Groundwater Sample		V	Trichloroethano		8	J	ug/L	
MW-4	B-2		17-Oct-91	Groundwater Sample		V	ALL VOLATILES		ND	NA	ug/L	NA
MW-6	E-5		17-Oct-91	Groundwater Sample		V	1,2-Dichloroethane (total)		190		ug/L	
MW-6	E-5		17-Oct-91	Groundwater Sample		V	Trichloroethano		2000		ug/L	
MW-7	D-7		17-Oct-91	Groundwater Sample		V	Vinyl chloride		17		ug/L	
MW-7	D-7		17-Oct-91	Groundwater Sample		V	Benzene		19	J	ug/L	
MW-7	D-7		17-Oct-91	Groundwater Sample		V	Toluene		2		ug/L	
MW-7	D-7		17-Oct-91	Groundwater Sample		V	Ethylbenzene		62		ug/L	
MW-7	D-7		17-Oct-91	Groundwater Sample		V	Xylene (total)		36		ug/L	
MW-8	C-10		17-Oct-91	Groundwater Sample		V	1,1,1-Trichloroethano		3	J	ug/L	
MW-9	A-4		17-Oct-91	Groundwater Sample		V	ALL VOLATILES		ND	NA	ug/L	NA
MW-10	A-8		17-Oct-91	Groundwater Sample		V	ALL VOLATILES		ND	NA	ug/L	NA
MW-11	F-7		17-Oct-91	Groundwater Sample		V	ALL VOLATILES		ND	NA	ug/L	NA
MW-11DUP	F-7		17-Oct-91	Groundwater Sample		V	ALL VOLATILES		ND	NA	ug/L	NA
MW-12	E-9		17-Oct-91	Groundwater Sample		V	ALL VOLATILES		ND	NA	ug/L	NA

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Antimony	28.2	J	ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Arsenic	22.5	J	ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Beryllium	5.1		ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Cadmium	8		ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Chromium	101	J	ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Copper	347		ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Lead	259		ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Mercury	0.17		ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Nickel	196		ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Selenium	4	R	ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Silver	3	U	ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Thallium	4	R	ug/L	
MW-2	B-7	NO	17-Oct-91	Groundwater Sample	M		Zinc	1090		ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Antimony	9	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Arsenic	5.1		ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Beryllium	1	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Cadmium	2	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Chromium	3	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Copper	3.1	J	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Lead	7.7		ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Mercury	0.1	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Nickel	9	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Selenium	2.2	UJ	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Silver	3	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Thallium	2.2	U	ug/L	
MW-2	B-7	YES	17-Oct-91	Groundwater Sample	M		Zinc	4.7	J	ug/L	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
						FOR					
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Antimony		29.5	J	ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Arsenic		6.9	J	ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Beryllium		3.7		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Cadmium		4.6		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Chromium		96.7	J	ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Copper		208		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Lead		109		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Mercury		0.29		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Nickel		202		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Selenium		8	R	ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Silver		3	U	ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Thallium		4	R	ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Zinc		645		ug/L	
MW-4	B-2	NO	17-Oct-91	Groundwater Sample	M	Antimony		9	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Arsenic		2		ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Beryllium		1	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Cadmium		2	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Chromium		3	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Copper		3	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Lead		1.9	J	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Mercury		0.1	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Nickel		9	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Selenium		2.2	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Silver		3	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Thallium		2.2	U	ug/L	
MW-4	B-2	YES	17-Oct-91	Groundwater Sample	M	Zinc		3	J	ug/L	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Antimony		24.8	J	ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Arsenic		2	J	ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Beryllium		12.1		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Cadmium		10.9		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Chromium		247		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Copper		860		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Lead		647		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Mercury		0.55		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Nickel		730		ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Selenium		8	R	ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Silver		3	U	ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Thallium		4	R	ug/L	
MW-6	E-5	NO	17-Oct-91	Groundwater Sample	M	Zinc		3260		ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Antimony		9	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Arsenic		2	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Beryllium		1	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Cadmium		2	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Chromium		3	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Copper		6.2	J	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Lead		2	J	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Mercury		0.1	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Nickel		9	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Selenium		2.2	UJ	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Silver		3	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Thallium		2.2	U	ug/L	
MW-6	E-5	YES	17-Oct-91	Groundwater Sample	M	Zinc		20.1		ug/L	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	UNITS	DETECTION LIMIT
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Antimony	18.9	J	ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Arsenic	4.5	J	ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Beryllium	3		ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Cadmium	2.8		ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Chromium	66.4		ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Copper	155		ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Lead	147		ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Mercury	0.1	U	ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Nickel	152		ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Selenium	8	R	ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Silver	3	U	ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Thallium	4	R	ug/L	
MW-7	D-7	NO	17-Oct-91	Groundwater Sample	M		Zinc	513		ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Antimony	9	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Arsenic	7.6		ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Beryllium	1	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Cadmium	2	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Chromium	3	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Copper	3	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Lead	3.8	J	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Mercury	0.1	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Nickel	9	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Selenium	2.2	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Silver	3	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Thallium	2.2	U	ug/L	
MW-7	D-7	YES	17-Oct-91	Groundwater Sample	M		Zinc	4.7	J	ug/L	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

YES/NO			ANALYSIS			DETECTION				
SAMPLE #	GRID #	FILTERED	DATE	DESCRIPTION	CATEGORY	FOR	RESULTS	QUALIFIER	UNITS	LIMIT
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Antimony	28.7	J	ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Arsenic	58.9	J	ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Beryllium	4.5		ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Cadmium	6		ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Chromium	96.5		ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Copper	175		ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Lead	132		ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Mercury	0.1	U	ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Nickel	169		ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Selenium	8	R	ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Silver	3	U	ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Thallium	4	R	ug/L	
MW-10	A-8	NO	17-Oct-91	Groundwater Sample	M	Zinc	550		ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Antimony	9	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Arsenic	12.1		ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Beryllium	1	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Cadmium	2	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Chromium	3	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Copper	3	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Lead	2.7	J	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Mercury	0.1	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Nickel	9	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Selenium	2.2	UU	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Silver	3	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Thallium	2.2	U	ug/L	
MW-10	A-8	YES	17-Oct-91	Groundwater Sample	M	Zinc	3.7	J	ug/L	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR		RESULTS	QUALIFIER	DETECTION LIMIT	
						ANALYSIS	FOR			UNITS	LIMIT
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Antimony		65.4	J	ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Arsenic		45.9	J	ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Beryllium		6.2		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Cadmium		8.7		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Chromium		149	J	ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Copper		322		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Lead		225		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Mercury		0.14		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Nickel		278		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Selenium		8	R	ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Silver		9		ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Thallium		4	R	ug/L	
MW-11	F-7	NO	17-Oct-91	Groundwater Sample	M	Zinc		1090		ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Antimony		9	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Arsenic		4.1	J	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Beryllium		1	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Cadmium		2	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Chromium		3	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Copper		3	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Lead		2.2	J	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Mercury		0.1	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Nickel		9	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Selenium		2.2	UJ	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Silver		3	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Thallium		2.2	U	ug/L	
MW-11	F-7	YES	17-Oct-91	Groundwater Sample	M	Zinc		3	U	ug/L	

RICKENBACKERANGB HAZARDOUS WASTE STORAGE AREA

ANALYTICAL RESULTS - GROUNDWATER

SAMPLE #	GRID #	YES/NO FILTERED	DATE	DESCRIPTION	CATEGORY	ANALYSIS FOR			DETECTION LIMIT		
						RESULTS	QUALIFIER	UNITS			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Antimony		ug/L	J		
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Arsenic		ug/L	J		
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Beryllium		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Cadmium		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Chromium		ug/L	J		
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Copper		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Lead		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Mercury		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Nickel		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Selenium		ug/L	R		
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Silver		ug/L	U		
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Thallium		ug/L	R		
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Zinc		ug/L			
MW-12	E-9	NO	17-Oct-91	Groundwater Sample	M	Antimony		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Arsenic		ug/L			
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Beryllium		ug/L	J		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Cadmium		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Chromium		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Copper		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Lead		ug/L	J		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Mercury		ug/L	J		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Nickel		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Selenium		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Silver		ug/L	UJ		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Thallium		ug/L	U		
MW-12	E-9	YES	17-Oct-91	Groundwater Sample	M	Zinc		ug/L	U		

TABLE A.1
SOLUBILITY CONSTANTS
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER AIR NATIONAL GUARD BASE

Compound	Water Solubility (1)
Acetone	1000000 mg/L (2)
Benzene	1750 mg/L
Carbon Tetrachloride	757 mg/L
Chloroethane	N/A (3)
Chloroform	82000 mg/L
Creosol	31000 mg/L
1,1-Dichloroethane	280 mg/L
1,2-Dichloroethane	5500 mg/L
cis-1,2-Dichloroethene	3500 mg/L
trans-1,2-Dichloroethene	6300 mg/L
Ethylbenzene	152 mg/L
Dichloromethane	4600 mg/L
2-Butanone	268000 mg/L
Phenol	93000 mg/L
1,1,1,2-Tetrachloroethane	2900 mg/L
1,1,2,2-Tetrachloroethane	2900 mg/L
Tetrachloroethene	150 mg/L
Methylchloroform	N/A
1,1,2-Trichloroethane	4500 mg/L
Trichloroethene	1100 mg/L
Vinyl Chloride	2670 mg/L
Xylenes	198 mg/L

(1) Source— Superfund Public Health Evaluation Manual, EPA/540/1-86/060, October 1986.

(2) mg/L— milligrams per liter

(3) Not available.

REVISED MARCH 1993

APPENDIX B-2

**SUMMARY OF PREVIOUS INVESTIGATIONS, INCLUDING 1991
ANALYTICAL DATA**

APPENDIX B

PREVIOUS INVESTIGATIONS

1.0 1988 FIELD INVESTIGATION

Engineering-Science (ES) completed the first phase of the field investigation at the Hazardous Waste Storage Area (HWSA) in October 1988. The purpose of the investigation was to determine if the soil or groundwater beneath the site had been contaminated due to spills or leaks from on-site storage containers.

The results of this investigation are presented in detail in the Field Investigation Report - Hazardous Waste Storage Area: Rickenbacker Air National Guard Base, Columbus, Ohio (1989), and the results are summarized in the following paragraphs.

1.1 SUMMARY OF ANALYTICAL RESULTS

The soil-gas survey identified with elevated concentrations of benzene, toluene and ortho-xylene (BTX). Concentration of total BTX in the soil gas ranged from undetectable to 29.8 ppm.

Analyses of the soil samples indicated elevated semi-volatile organic and metals concentrations. The characteristics of the semi-volatile organics found were typical of coal-tar derivatives and phthalates. Metals identified included cadmium, chromium, copper, lead and zinc.

Three of the auger borings made during soil sampling were completed as monitoring wells in the shallow aquifer. Water samples from two of these wells exhibited volatile organic concentrations in excess of Federal Maximum Contaminant Levels (MCLs). Water from MW1 contained 94 $\mu\text{g/l}$ benzene, 20 $\mu\text{g/l}$ xylenes and 13 $\mu\text{g/l}$ methylnaphthalene. Water from MW3 contained 44 $\mu\text{g/l}$ trichloroethene. Samples from all wells had total unfiltered metals concentrations in excess of Federal Drinking Water Standards for arsenic, cadmium, chromium and lead.

2.0 1990 FIELD INVESTIGATION

The phase of the field investigation at the HWSA was completed in March 1990. The purpose of this additional field investigation was to determine the extent of contamination and to allow revision of the Closure Plan to affect a "clean" closure of the site.

The pre-closure sampling activities included soil sampling at the surface and at depth and the installation of six new monitoring wells in and around the HWSA (MW4 through MW9). The results of this investigation are presented in detail in the Pre-Closure Sampling Report - Hazardous Waste Storage Area: Rickenbacker Air National Guard Base, Columbus, Ohio (1992), and a summary of the results follows.

2.1 SUMMARY OF ANALYTICAL RESULTS

2.6.1 Metals

Total metals were found over the site with higher levels within the fenced area. Detected above background criteria were beryllium, cadmium, copper, lead, mercury, silver and zinc.

2.2 VOLATILE ORGANIC COMPOUNDS

Volatile organic compounds in samples from the 0-2 foot interval, were only analyzed for at six hand boring and two monitoring well locations. The only VOCs detected were 440,000 $\mu\text{g/kg}$ o-xylene at HB1.

Volatile organic compounds were detected at concentrations up to 1,900,000 $\mu\text{g/kg}$ in soils from the 3-5 foot interval. Elevated ethylbenzene and o-xylene concentrations were found in HB1, near Building 560, while benzene was detected in AB2.

Volatile organics were found in samples from the 8-10 foot interval at levels up to 27,000 $\mu\text{g/kg}$ of o-xylene. The highest concentrations were found at AB1, AB14 and MW7. Specific compounds include: benzene, ethylbenzene, xylenes and 1,1,1-trichloroethane.

Samples from the 13-15 foot interval containing volatile organic compounds were found in the southern corner and along the northeast side of the area. These include:

benzene, ethylbenzene, toluene, xylenes, acetone, trichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride. The highest concentration was 1,000 $\mu\text{g/kg}$ trans-1,2-dichloroethene at MW6.

At the greater than fifteen foot interval, sand and gravel is present to a depth of approximately 25' with a thin layer of clay from 18'-19'. Detected volatile and semi-volatile organics were confined to the southeast side of the area. Semi-volatile organics were found only at MW1 at a total concentration of 1,830 $\mu\text{g/kg}$. The highest volatile organic concentrations were also found at this location. They were benzene, ethylbenzene, and o-xylene at concentrations of 1,900, 11,000, and 20,000 $\mu\text{g/kg}$, respectively.

2.3 SEMI-VOLATILE ORGANIC COMPOUNDS

Semi-volatile organics were detected in the soils at various depths and ranged from non-detect to 4,630 $\mu\text{g/kg}$.

2.6.2 Groundwater

Volatile and Semi-Volatile Organics

On the analytical results map (Sheet 6), both the 1990 and 1988 sampling data are shown. The only semi-volatile organic compound found in the groundwater was 2-methylnaphthalene at 5J $\mu\text{g/L}$ in MW8.

Volatile organics compounds were detected in MW1, MW3, MW6 and MW7, and include benzene, ethylbenzene, o-xylene, p-xylene, trichloroethene, and trans-1,2-dichloroethene. In addition, four feet of phase-separated hydrocarbons were floating in MW5. Fingerprint analysis of the liquid hydrocarbons identified it as a 30 to 40 percent weathered gasoline mixed with jet fuel.

Filtered Metals

Four metals were detected at all concentrations below the Federal Drinking Water Standards. These four metals were arsenic (found at 2.0 to 9.4 $\mu\text{g/L}$), lead (found at 3.1 to 14.0 $\mu\text{g/L}$), zinc (found at 5.0 to 35 $\mu\text{g/L}$) and mercury (found at 0.11 $\mu\text{g/L}$).

3.0 1991 FIELD INVESTIGATION

The third phase of the field investigation at the HWSA was completed in October 1991. Field activities conducted during this investigation include groundwater screening, monitoring well installation and soil sampling from the well borings, surface soil sampling, and groundwater sampling.

The additional sampling was conducted to fill data gaps existing after the original pre-closure sampling report. Specifically, these data gaps are:

- The anomalously high concentrations of semi-volatile organic compounds (SVOCs) found at the surface soils of the westernmost corner of the HWSA.
- The extent of VOCs previously detected in the groundwater.

The results of this investigation were reported in the Addendum to the Pre-Closure Sampling Report - Hazardous Waste Storage Area: Rickenbacker Air National Guard Base, Columbus, Ohio (1992) and a summary of the results follows.

The data obtained through the groundwater sampling indicate that petroleum hydrocarbon and chlorinated organic contamination is restricted to the area upgradient and downgradient of the four underground storage tanks (USTs) numbered 47, 48, 49, 50. Wells MW1 and MW5, where phase-separated hydrocarbons were observed, lie in the northern and furthest upgradient portion of this contaminant plume. In the downgradient direction, the dissolved organic plume does not extend to MW11 and MW12.

Volatile organic results of the groundwater sampling events indicate that chlorinated organics are present in MW3 and MW6. The compound 1,1,1-trichloroethane was found at an estimated concentration of 3 $\mu\text{g/L}$ in MW8 during the 1991 sampling event. This compound was also found in MW2 at an estimated quantity of 2 $\mu\text{g/L}$. Although this compound was found in the associated trip blank, it is still possible that it is present at this site since it has been detected in the past.

No groundwater samples were collected from MW5 in either sampling event due to the presence of PSH. In 1990, MW1 had concentrations of dissolved benzene, ethylbenzene and xylenes; however, due to the presence of PSH in 1991, this well was

not resampled. Dissolved benzene, ethylbenzene and xylenes were found in MW7. No volatile organics were detected in MW4 and MW9.

The semi-volatile organic compounds, 2-methylnaphthalene and naphthalene were found in MW7 at estimated concentrations 2 and 6 $\mu\text{g/L}$ respectively.

Groundwater analyses indicate the presence of total metals in the water samples; however, the filtered aliquot analysis showed a decrease in metals concentrations. Therefore, the presence of metals is associated with the silt suspended in the water sample.

Four metals were detected in filtered groundwater samples, all at concentrations below the Federal Drinking Water Standards. These four metals were arsenic found at 2.9 to 12.1 $\mu\text{g/L}$, copper at 3.1 to 6.2 $\mu\text{g/L}$, lead at 1.9 to 7.7 $\mu\text{g/L}$, and zinc at 3.7 to 20.1 $\mu\text{g/L}$.

Soil Results

Five of the ten surface soil samples were collected at the fenceline surrounding the site, the remaining five from locations off site. One sample (SS3) was collected in duplicate. All surface soil samples were analyzed for SVOCs and the priority pollutant metals.

Samples with no detected SVOCs are SS1, SS2 and SS7. Samples SS3, SS9 and SS10 have the highest total SVOC concentrations, 1108, 2250 and 977 $\mu\text{g/kg}$ respectively. The SVOCs detected can be classified as coal tar derivatives.

Metals analysis from these surface soil samples were compared to background levels that were established for the Base during the Site Investigation for the Installation Restoration Program. Detected above background criteria were arsenic, cadmium, copper, lead, nickel, silver and zinc.

Soil boring samples were collected from two depths (3 to 5 feet and 13 to 15 feet) in each of the three soil borings. Each sample was analyzed for SVOCs, VOCs, and priority pollutant metals. SVOCs were not detected in either of the two samples from MW10 and MW11. The soil sample from the 13 to 15 foot horizon of MW12 had a total semi-volatile concentration of 1569 $\mu\text{g/kg}$ although no SVOCs were detected in the shallow soil sample (3 to 5 feet), or in the groundwater sample from this well. These compounds are coal tar derivatives.

0115003

CL115.17

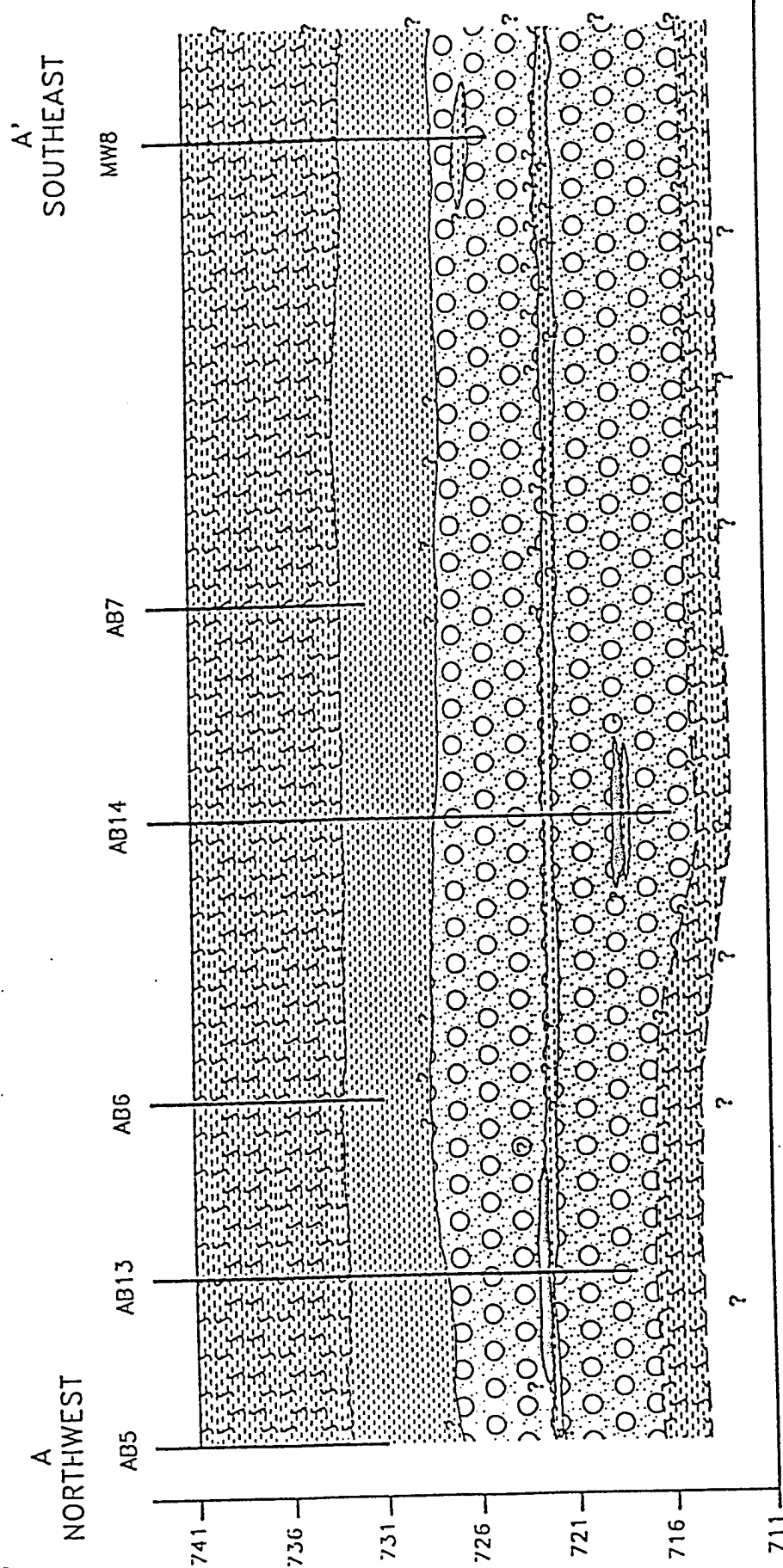
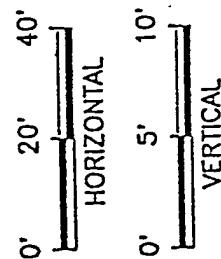
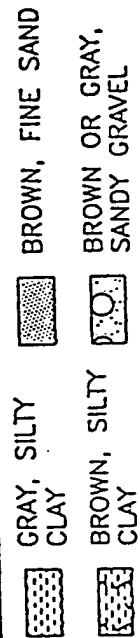


FIGURE B.1

HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB
CROSS-SECTION OF SUBSURFACE
LITHOLOGIES FROM A TO A'.



LEGEND:



B' SOUTHWEST

MW6

AB10

AB15

AB12

B NORTHEAST

AB3

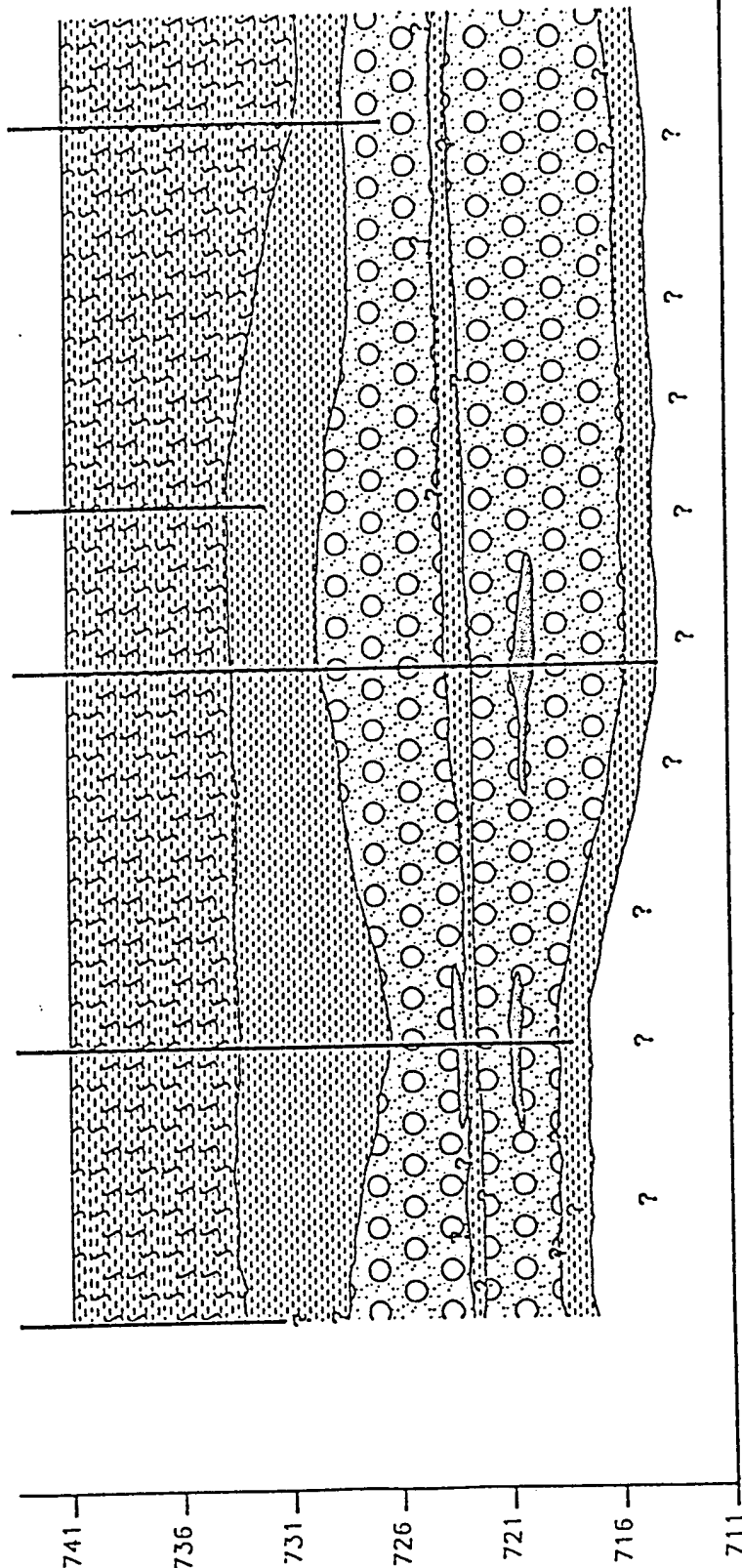
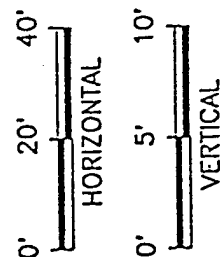


FIGURE B.2

HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB
CROSS-SECTION OF SUBSURFACE
LITHOLOGIES FROM B TO B'

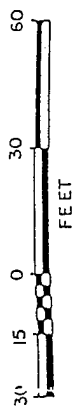


LEGEND:

- GRAY, SILTY CLAY
- BROWN, FINE SAND W/INTERBEDDED FINE SANDS
- BROWN, SILTY CLAY
- BROWN OR GRAY, SANDY GRAVEL

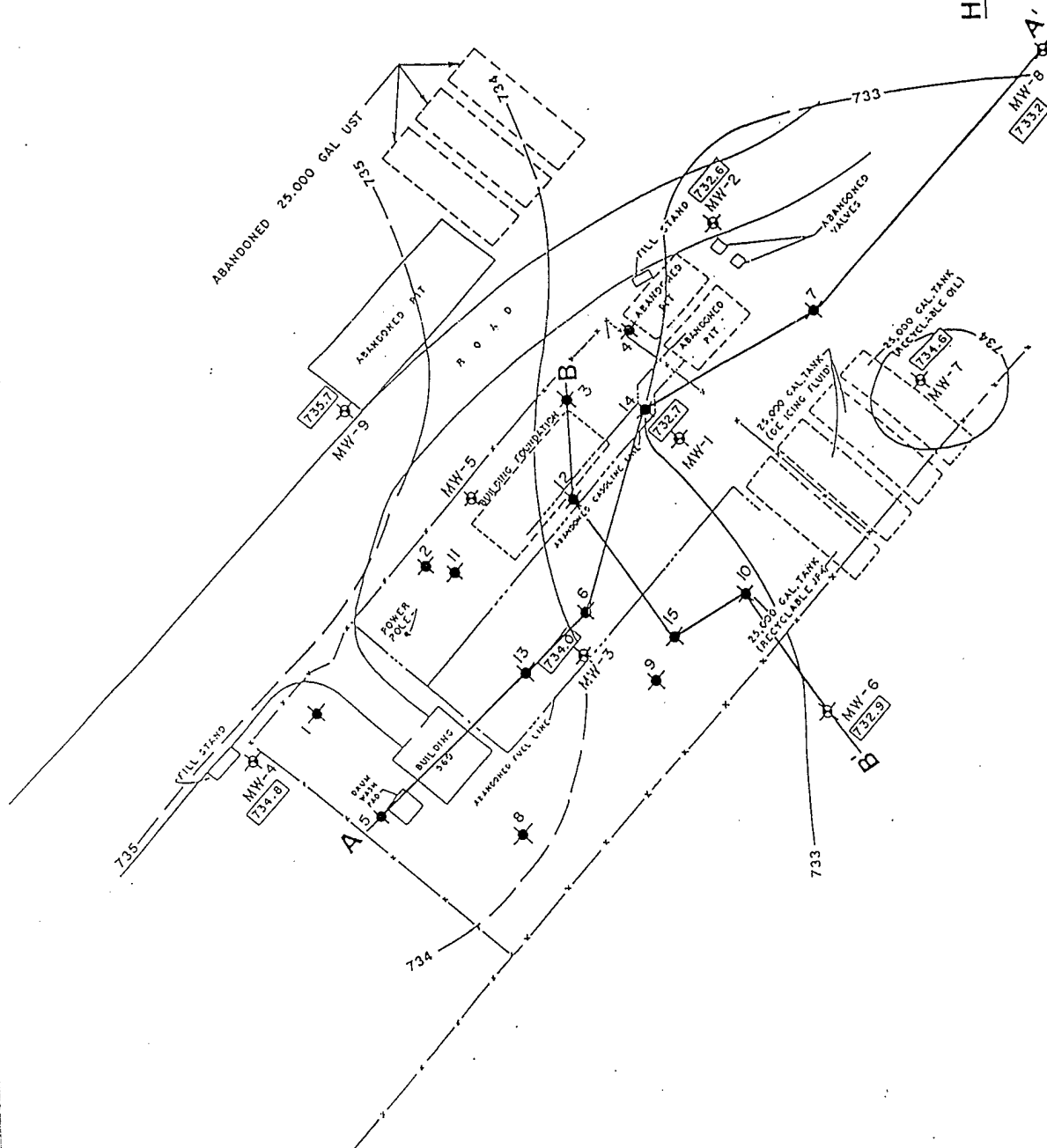
No VOCs were detected in the soils from borings from MW10, MW11 and MW12.

Metals analysis from the soil samples obtained from the soil borings were also compared to the background levels for the Base. Detected above background criteria were arsenic, beryllium, cadmium, chromium, copper.



1	RB-HW-AB1
2	RB-HW-AB2
3	RB-HW-AB3
4	RB-HW-AB4
5	RB-HW-AB5
6	RB-HW-AB6
7	RB-HW-AB7
8	RB-HW-AB8
9	RB-HW-AB9
0	RB-HW-AB10
1	RB-HW-AB11
2	RB-HW-AB12
3	RB-HW-AB13
4	RB-HW-AB14
5	RB-HW-AB15

FIGURE B.3
CROSS-SECTION LOCATION AND
WATER SURFACE MAP
HAZARDOUS WASTE STORAGE AREA
RICKENBACKER ANGB, OHIO
6 FEBRUARY 1990



GROUNDWATER SURVEY
RICKENBACKER ANGB, OHIO

October 1991

Prepared for:

Engineering Science
Cleveland, Ohio

Project 533935

BURLINGTON ENVIRONMENTAL, MATHES DIVISION
4091 Venture Place
Groveport, Ohio 43125

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5 QUALITY CONTROL	5

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APPENDIX B Gas Chromatograph Plots

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GROUNDWATER SURVEY
RICKENBACKER ANGB, OHIO

1. INTRODUCTION

Engineering Science (ES) requested that John Mathes & Associates, Inc., (Mathes) perform a groundwater survey at the site located at Rickenbacker ANGB, Ohio.

The purpose of this survey was to evaluate the potential presence, and estimate the extent of impact, of volatile organic compounds (VOCs) at the above mentioned facility. This survey was performed by obtaining and analyzing groundwater samples on site.

Mathes arrived at the facility on October 7, 1991. Groundwater sampling was performed from October 7 to October 9, 1991.

SUMMARY

Twenty one groundwater samples from 17 probe hole locations were collected and analyzed. Three duplicate groundwater samples, and ten sample blanks were also analyzed. Samples were analyzed for the following chemicals:

- o benzene;
- o ethylbenzene;
- o m&p-xylene;
- o o-xylene;
- o toluene;
- o trichloroethylene;

The analytical results are summarized in Table 1. Site maps with sample locations are being prepared by ES.

SAMPLING LOCATIONS

Groundwater samples were collected on site at locations suspected by ES to be impacted with VOCs. Sampling locations were selected by ES based on on-site soil boring data previously obtained by ES, the location of underground utilities, groundwater flow, and vehicle accessibility.

Sampling locations were mapped by ES. At the request of ES, a sampling location map is not included in this report.

TABLE 1

GROUNDWATER ANALYTICAL RESULTS

RICKENBACKER ANGB, OHIO

Sample I.D.	Probe Hole Number	Depth (Feet)	Concentration (ug/L)					Comments
			Benzene	Trichloroethylene	Toluene	Ethylbenzene	Total Xylenes	
BLANK-01	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank
BLANK-02	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-Probe Rod Blank
GW-01	PH-01	16.0	8	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-02	PH-02	21.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-02D	PH-02	21.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-Duplicate
GW-03	PH-03	20.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-04	PH-04	16.0	ND(1)	55	1385	393	259	Groundwater
BLANK-03	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank
BLANK-04	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank
BLANK-05	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-Probe Rod Blank
GW-05	PH-05	20.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-06	PH-06	20.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-07	PH-07	20.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-08	PH-08	24.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-09	PH-09	24.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater

ND Not detected at the detection limit in parentheses

QC Quality Control

ug/L Micrograms per liter

. Not Applicable

TABLE 1

GROUNDWATER ANALYTICAL RESULTS

RICKENBACKER ANGB, OHIO

			Concentration (ug/L)					
Sample I.D.	Probe Hole Number	Depth (Feet)	Concentration (ug/L)				Comments	
			Benzene	Trichloroethylene	Toluene	Ethylbenzene		Total Xylenes
GW-10	PH-10	24.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-11	PH-11	24.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-12	PH-12	24.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-13	PH-13	24.0	168	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
BLANK-06	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank
GW-14	PH-14	18.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-14D	PH-14	18.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-Duplicate
BLANK-07	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank
BLANK-08	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank
BLANK-09	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-Probe Rod Blank
GW-15	PH-06	22.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-16	PH-06	20.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-17	PH-06	18.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-18	PH-06	16.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-19	PH-15	20.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-20	PH-16	20.0	4	ND(1)	ND(1)	ND(1)	ND(1)	QC-Duplicate
GW-20D	PH-16	20.0	3	ND(1)	ND(1)	ND(1)	ND(1)	Groundwater
GW-21	PH-17	20.0	172	ND(1)	ND(1)	ND(1)	6	Groundwater
BLANK-10	-	-	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	QC-System Blank

Twenty one groundwater samples and three duplicate groundwater samples were collected from 17 locations using the RECONSM System equipment. Samples were collected from a depth of 16 to 24 feet. Analytical results for the groundwater samples are presented in Table 1.

A hydraulic probe unit was used to drive and withdraw the groundwater sampling probes. A hydraulic hammer was used where necessary to assist in driving probes through unusually hard soil. The probes consisted of three-foot lengths of 0.75-inch-diameter threaded steel pipes with detachable drive points.

After the probe was inserted into the groundwater, the probe was withdrawn approximately one foot to create an annular space from which to collect a representative sample. A check valve attached to a length of polyethylene tubing was inserted through the probe into the water table. The sample was collected in the tubing, the tubing was pulled up, and the water in the tubing drained into a 40-milliliter (mL) glass vial sealed with a Teflon-lined septum screw cap. The sample was given to the GC technician for on-site analysis.

A Hewlett-Packard Model 5890A Series II gas chromatograph (GC) was used for the analysis of groundwater samples. Compound separation and detection were performed using a 30-meter wide-bore DB-624 volatile organic column and a flame-ionization detector (FID). Appendix A contains the GC field work sheets.

The groundwater samples were analyzed by modified U.S. Environmental Protection Agency (USEPA) Method 601/602. Modifications include use of a FID, a static headspace analysis, single-point calibration, and limited quality control measures.

Each sample vial was shaken for two minutes and heated at 70^o C for 10 minutes to equilibrate the volatile components between the liquid and the air in the vial. An aliquot of up to 400 microliters of the headspace was collected by inserting a syringe through the septum of the vial and pulling the headspace sample into the syringe. The sample was then injected directly into the GC.

Concentrations were measured based on an external standard calibration. Known concentrations of benzene, ethylbenzene, meta & para-xylene, ortho-xylene, toluene, and trichloroethylene were injected as a calibration gas mixture into the GC. Compound peak area versus standard concentration was used to calculate sample concentrations.

Compound identification was based on comparison of target compound retention times with sample unknowns.

Analytical results for the groundwater sample analyzed by this technique will not necessarily be the same as those obtained by submitting the same groundwater sample for laboratory analysis. Different extraction techniques are used in each case and, although method sensitivities and accuracies are comparable, different results are possible.

The detection limit is the lowest concentration of a compound that can be practicably measured relative to the calibration standard. Detection limits are a function of the injection volume, as well as detector sensitivity. The detection limit is calculated from the current response factor, the sample size, and the estimated peak area that would have been detected under the given conditions. For this survey, the detection limit for each of the target compounds, was 1 microgram per liter ($\mu\text{g/L}$).

Quality control is an essential part of an analytical test methodology. Quality control procedures increase the confidence in the analytical results and are used to evaluate the reproducibility of the data.

The GC was calibrated using a known concentration of each of the target compounds of interest at the beginning of the day before analysis of any samples. The USEPA recommends instrument calibration be performed at least once every 12 hours. The calibration helps to evaluate the operating conditions of the GC.

A chromatographic system blank is analyzed every 10 samples as a means of indication that sample carryover has not occurred. If sample carryover has occurred, the concentration detected in the system blank can be subtracted from any of the subsequent samples containing that compound. A probe rod blank is analyzed prior to sample collection to ensure that rods are free of contamination.

A duplicate sample, which is a second volume of soil-gas, groundwater, or soil collected from the same sample location, is analyzed once every 20 samples, or at least once daily for each survey. Three duplicate groundwater samples were collected at Probe Holes PH-2, PH-14, and PH-20. Duplicates are used to evaluate the reproducibility of the analytical data. The analytical results for each of the respective duplicate samples collected at Probe Holes PH-2, PH-14, and PH-20 were within the specified limit of plus or minus 20 percent.

Appendix A

Gas Chromatograph
Field Work Sheets

RECONSM SAMPLE ANALYSIS WORK SHEET

Date 10-7-91 Project Name Rickabacker, ANCB Project Number 533935 Phase 1003 Task 77

Operator Nick Crano Equipment: GC Hewlett-Packard 5890 A

Carrier Gas: H2 ☒ He Pressure (kPa) 100 Detector FID Temp. (C) 300

oven Temp. Profile Temp. 1 70 Temp. 2 ✓
(C) Time 1 10 min Time 2 SE-54 / 15 meter 0.53

injector Temp. (C) 200 Final Temp. SE-54 / 15 meter 0.53

Sample I.D.	Probe Hole Number	Depth (ft)	Analysis Time	Inf. Vol. (ul)	Multiplier	VAC in. Hg	Comments
BLANK-01	-	-	9:19	400	0.25	-	QC-SYSTEM BLANK
STD-1007	-	-	9:34	100	1.0	-	CALIBRATION STD
BLANK-02	-	-	11:09	400	0.25	-	QC-R00 BLANK
GW-01	PH-01	16'	11:34	400	0.25	-	CROUND WATER
GW-02	PH-02	21'	12:35	400	0.25	-	CROUND WATER
GW-02D	PH-02	21'	12:48	400	0.25	-	QC-DUPLICATE
GW-03	PH-03	20'	14:07	400	0.25	-	CROUND WATER
GW-04	PH-04	16'	15:35	50	2.0	-	CROUND WATER
BLANK-03	-	-	16:24	400	0.25	-	QC-SYSTEM BLANK
RT-01	-	-	16:36	100	1.0	-	QC-RT CHECK

-duplicate sample analysis
C-quality control

RECONSM SAMPLE ANALYSIS WORK SHEET

te 10-8-91 Project Name Ricknabaker ANG6 Project Number 531935 Phase 1002 Task 77

Operator Nick Crano Equipment: GC Hewlett-Packard 5890 A

Carrier Gas: H2 / He Pressure (kPa) 100 Detector FID Temp. (C) 300

Injection Temp. Profile Temp. 1 70° Temp. 2 30 meter 0.53
(C) Time 1 10 min SE-54 / 15 meter 0.53

Injection Temp. (C) 200 Final Temp. 300

Sample I.D.	Probe Hole Number	Depth (ft)	Analysis Time	Inj. Vol. (ul)	Multiplier	VAC in. Hg	Comments
BLANK-04	-	-	7:16	400	0.25	-	QC-SYSTEM BLANK
STD-1008	-	-	7:47	100	1.0	-	CALIBRATION STD.
BLANK-05	-	-	8:05	400	0.25	-	QC-ROD BLANK
GW-05	PH-05	20'	8:57	400	0.25	-	GROUND WATER
GW-06	PH-06	20'	10:09	400	0.25	-	GROUND WATER
GW-07	PH-07	20'	10:33	400	0.25	-	GROUND WATER
GW-08	PH-08	24'	12:04	400	0.25	-	GROUND WATER
GW-09	PH-09	24'	13:40	400	0.25	-	GROUND WATER
GW-10	PH-10	24'	14:12	400	0.25	-	GROUND WATER
GW-11	PH-11	24'	14:41	400	0.25	-	GROUND WATER
GW-12	PH-12	24'	15:12	400	0.25	-	GROUND WATER
GW-13	PH-12	24'	15:43	400	0.25	-	GROUND WATER

-duplicate sample analysis
C-quality control

Site	Project Name	Project Number	Phase	Task
17-5-11	Rückbauer, ANGB	53935	1003	77

Operator Nick C. Canu Equipment: GC Hewlett-Packard 5890 A

Carrier Gas: H₂ / He _____ Pressure (kPa) 100
 Detector FID Temp: (C) 300

Open Temp. Profile	Temp. 1	Temp. 2	Column
70°	DB-624 / 30 meter	0.53	✓
100°	SE-54 / 15 meter	0.53	—

Final Temp. _____

[illegible]

duplicate sample analysis
; quality control

RECON SAMPLE ANALYSIS WORK SHEET

Project Name Richland, AK, ANCB Project Number 533935 Phase 1003 Task 77

Equipment: GC Hewlett-Packard 5890 A

Operator Nick C. 240

Carrier Gas: H2 ☒ He Pressure (kPa) 100 Detector FID Temp. (C) 300

Injection Temp. (C) 70 Temp. 2 ✓
Time 1 10 min Time 2 SE-54 / 15 meter 0.53
Final Temp. DB-624 / 30 meter 0.53

Injection Temp. (C) 200

Sample I.D.	Probe Hole Number	Depth (ft)	Analysis Time	Inj. Vol. (ul)	Multiplier	VAC in. Hg	Comments
BLANK-08	-	-	7:13	400	0.25	-	QC-SYSTEM BLANK
STD-1009	-	-	7:45	100	1.0	-	CALIBRATION STD
BLANK-09	-	-	8:11	400	0.25	-	QC-ROD BLANK
GW-15	PH-06	22'	9:05	400	0.25	-	GROUND WATER
GW-16	PH-06	20'	9:30	400	0.25	-	GROUND WATER
GW-17	PH-06	18'	9:50	400	0.25	-	GROUND WATER
GW-18	PH-06	16'	10:11	400	0.25	-	GROUND WATER
GW-19	PH-15	20'	11:44	400	0.25	-	GROUND WATER
GW-20	PH-16	20'	12:14	400	0.25	-	GROUND WATER
GW-20D	PH-16	20'	12:27	400	0.25	-	QC-DUPLICATE
GW-21	PH-17	20'	12:40	400	0.25	-	GROUND WATER
BLANK-10	-	-	12:57	400	0.25	-	QC-SYSTEM BLANK

duplicate sample analysis
quality control

Date	Project Name	Project Number	Phase	Task
10-9-91	Ruckelshaus ANGB	533935	1003	77

Operator: Nick Cunn Equipment: GC Hewlett-Packard 5890 A

Carrier Gas: H₂ / He Pressure (kPa) 100 Detector FID Temp. (°C) 300

oven Temp. Profile	Temp. 1	70	Temp. 2
(C)	Time 1	10 min	Time 2
			Final Temp.

Injector Temp. (C)	200	Final Temp.

[illegible]

-duplicate sample analysis
C=quality control

Appendix B

Gas Chromatograph Plots

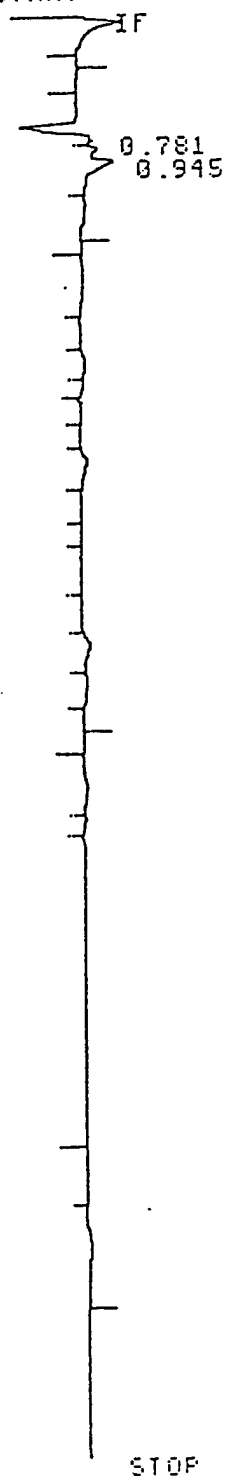
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+ OP # 7

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SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: BLANK-01
REPORT MEMO:

* RUN # 2 OCT 7, 1991 09:19:48
START



STOP

Closing signal file B:0361801

RUN # 2-002

RUN# 2 OCT 7, 1991 09:19:48

SAMPLE NAME: BLANK-01

SIGNAL FILE: B:Q362ACB5.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

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	.945	27045	UU	.215	18.92742

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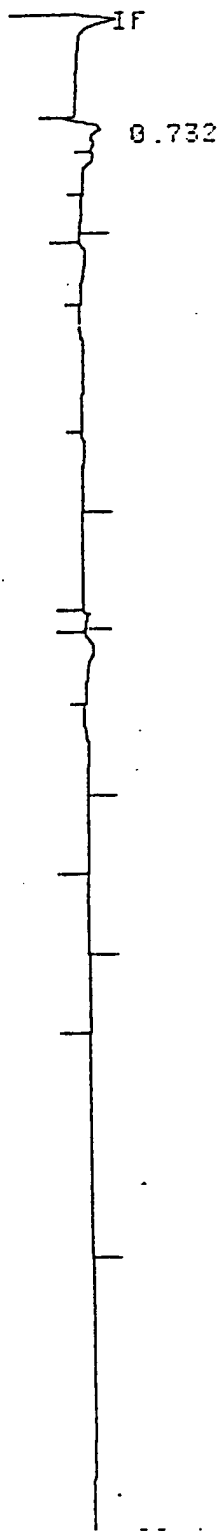
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OP # 7

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MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: BLANK-02
REPORT MEMO:

* RUN # 4 OCT 7, 1991 11:09:20
START



Crossing signal file 0:Q3620662.BNC

RUN# 4 OCT 7, 1991 11:09:20

SAMPLE NAME: BLANK-02

SIGNAL FILE: 0:Q3620662.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

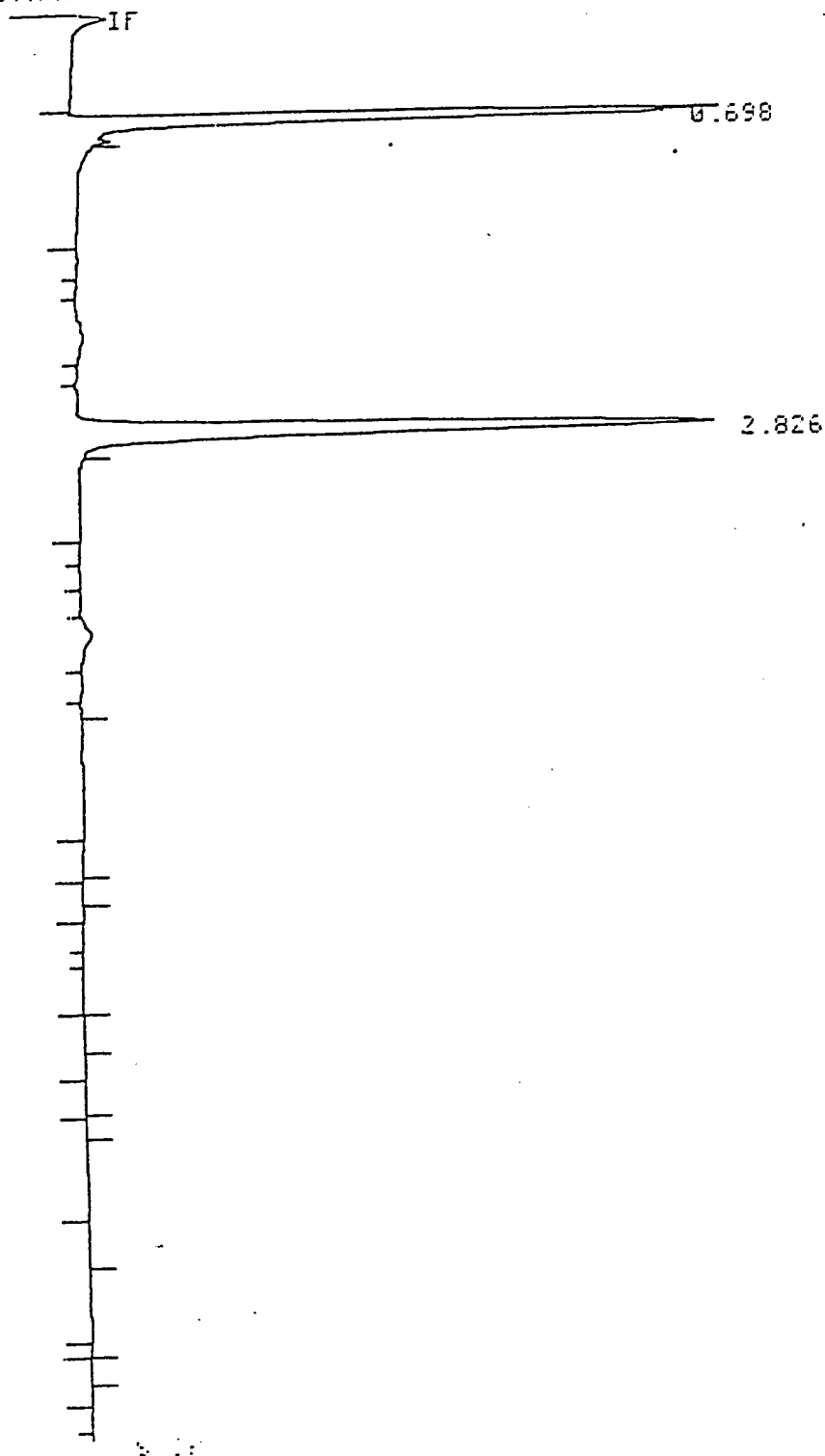
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MUL FACTOR=2.5000E-01

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SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-02
REPORT MEMO: PH-02

* RUN # 6 OCT 7, 1991 12:35:37
START



RUN#

6

OCT 7, 1991 12:35:37

SAMPLE NAME: SJ-02

PH-02

SIGNAL FILE: B:Q362DA9A.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CL#	ug/L	NAME
.698	PB	70913	.061		.000	
2.826	PB	99953	.089	3R	.000	INT. STD.

TOTAL AREA= 170866

MUL FACTOR=2.5000E-01

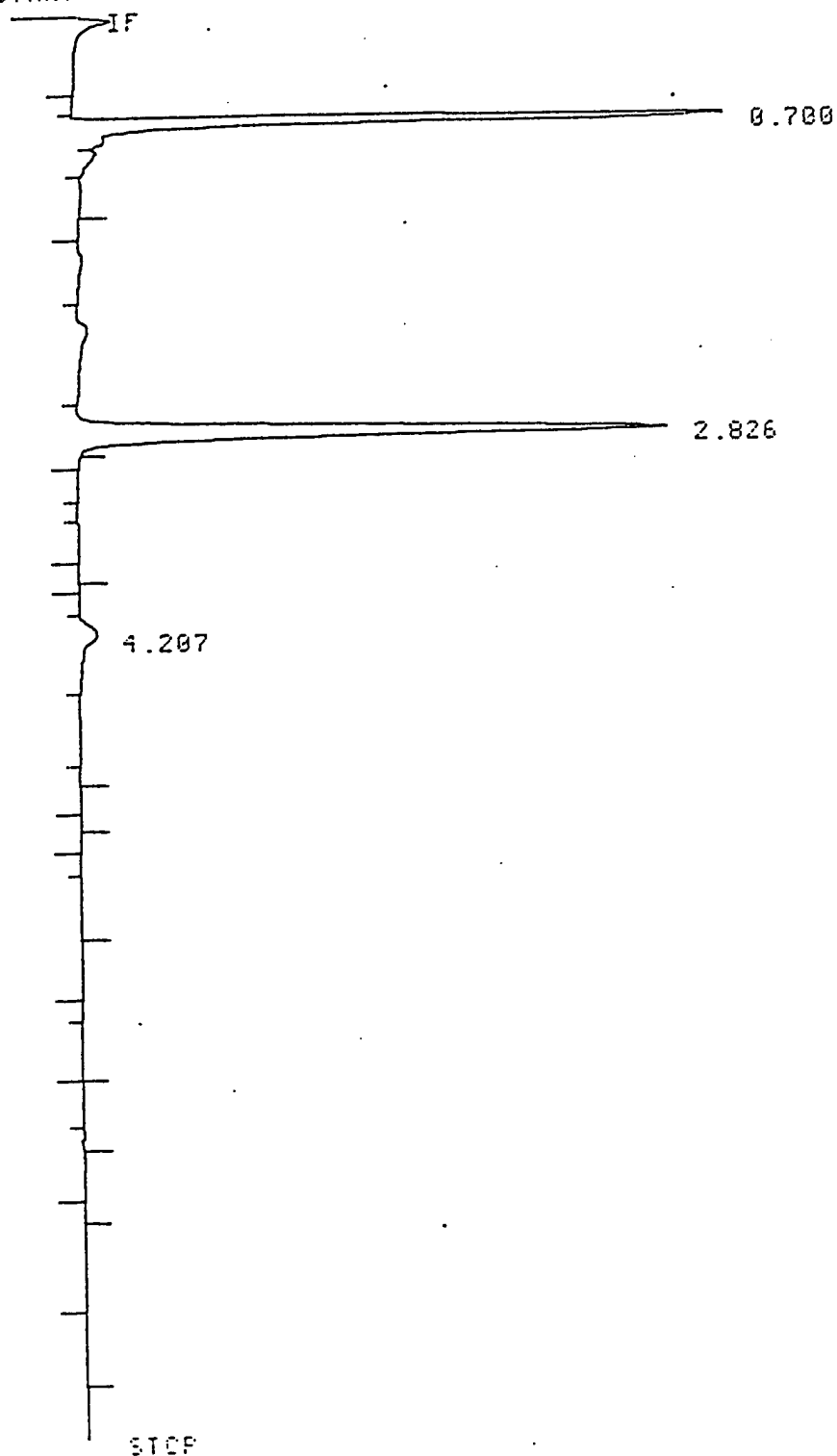
GRP#	ug/L	NAME
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* OP # 7

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SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GU-020
REPORT MEMO: PH-02

* RUN # 7 OCT 7, 1991 12:48:59
START



P011# 7 OCT 7, 1991 12:48:59

SAMPLE NAME: GW-020
FH-02

SIGNAL FILE: B:Q362000C.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA				ug/L	NAME
RT	TYPE	AREA	WIDTH CAL#		
.700	PU	68409	.059	.000	
2.826	PB	85853	.082 3R	.000	INT. STD.
4.207	UP	5293	.155	.000	

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MUL FACTOR=2.5000E-01

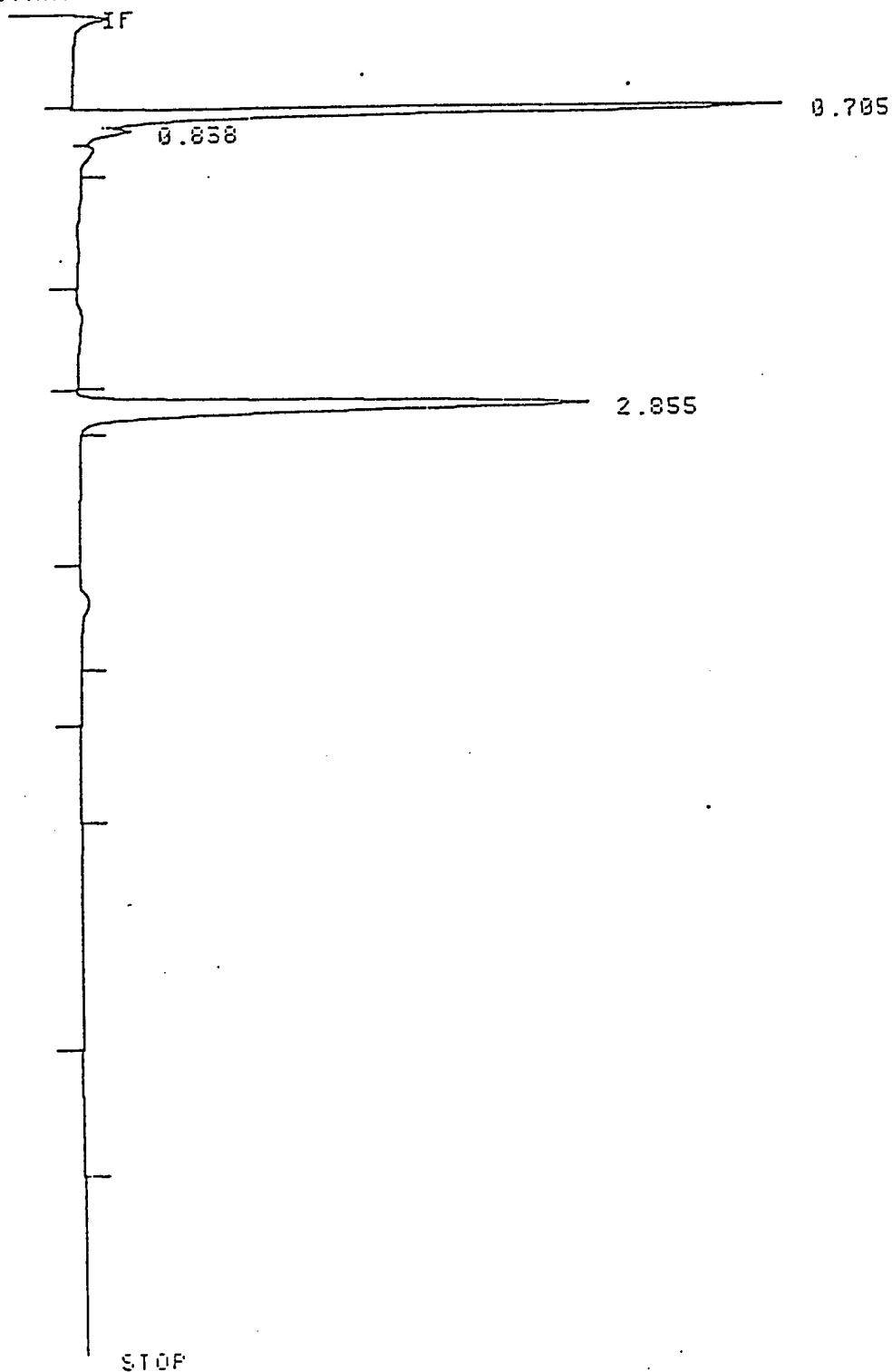
GRP#	ug/L	NAME
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* OP # 7

DEFAULT SAMPLE INFORMATION
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ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-03
REPORT MEMO: PH-03

* RUN # 8 OCT 7, 1991 14:07:03
START



RUN# 8

OCT 7, 1991 14:07:03

SAMPLE NAME: GW-03

PH-03

SIGNAL FILE: B:Q362F008.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.705	PV	83711	.062		.000	
.838	UV	6755	.062		.000	
2.855	PB	87170	.090	3R	.000	INT. STD.

TOTAL AREA= 177636

MUL FACTOR=2.5000E-01

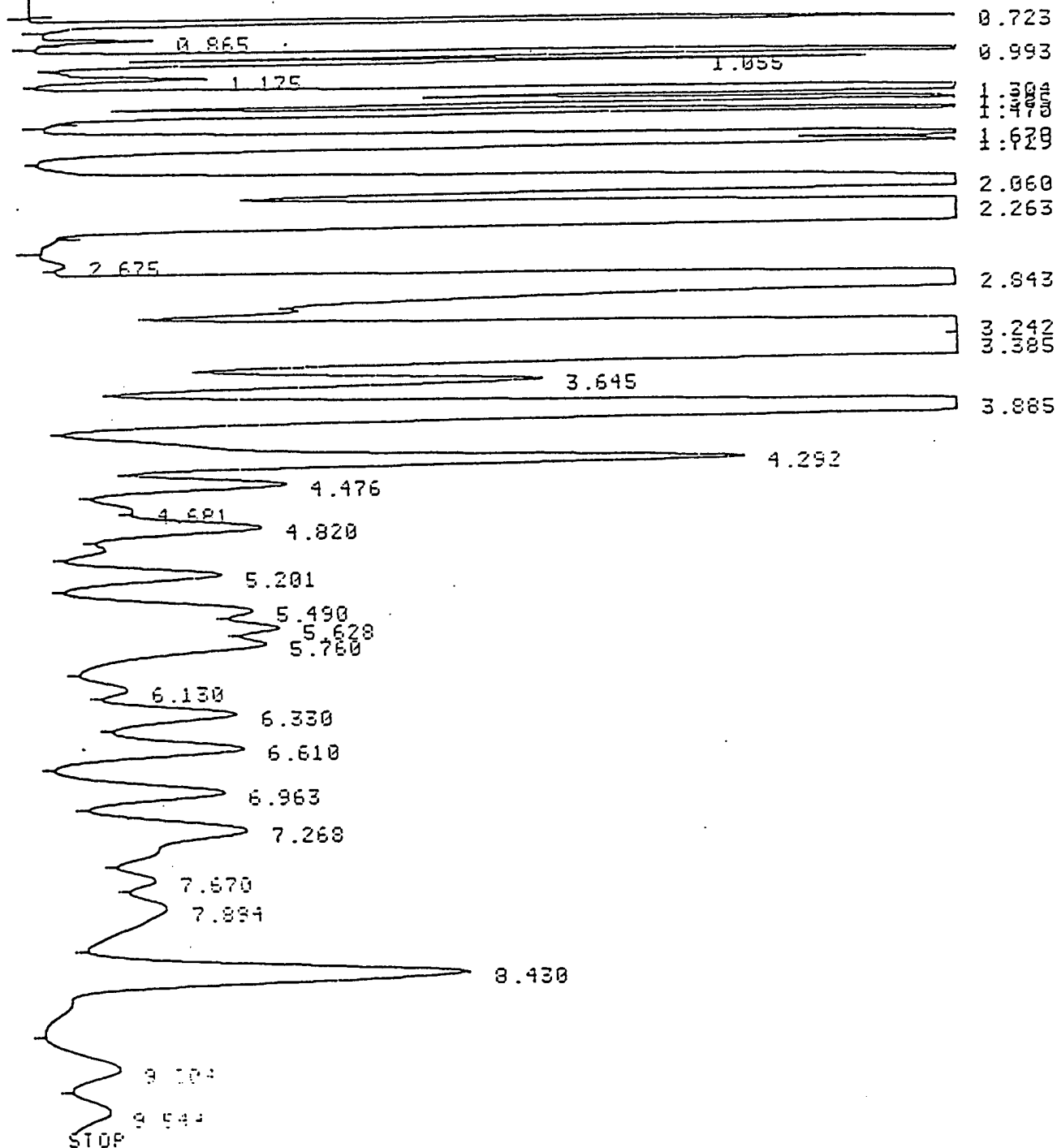
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]: 2
RECALIBRATION [Y/N*]:
NAME: GW-04
REPORT MEMO: PH-04

* RUN # 10 OCT 7, 1991 15:35:13
START

IF



Closing signal file 9:03630482.SNC

RUN# 10 OCT 7, 1991 15:35:13

SAMPLE NAME: GW-04
PH-04

SIGNAL FILE: B:Q36304B2.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA	RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
	.723	PB	109018	.021		.000	
	.865	BB	6165	.025		.000	
	.995	BU	196771	.029		.000	
	1.055	UU	50451	.029		.000	
	1.175	UP	16644	.045		.000	
	1.304	PU	342242	.041		.000	
	1.385	UU	112840	.042		.000	
	1.470	UB	97149	.059		.000	
	1.670	BU	165499	.053		.000	
	1.729	UP	108061	.050		.000	
	2.060	PU	425747	.105		.000	
	2.263	UB	1761999	.085		.000	
	2.675	PU	3987	.070	2	54.940	TCE
	2.843	UU	817443	.116	3R	.000	INT. STD.
	3.242	UU	745023	.094		.000	
	3.385	UU	1091792	.116		.000	
	3.645	UU	116104	.111		.000	
	3.885	UU	449209	.128		1385.000	Toluene
	4.292	UU	190415	.129		.000	
	4.476	UU	62069	.120		.000	
	4.681	UU	20081	.102		.000	
	4.820	UU	67472	.145		.000	
	5.201	UU	50624	.133		.000	
	5.490	UU	61399	.138		.000	
	5.629	UU	65131	.131		.000	
	5.760	UU	84455	.179		.000	
	6.130	UU	28627	.155		.000	
	6.330	UU	69667	.171		.000	
	6.610	UU	69522	.164		.000	
	6.963	UU	64344	.168		.000	
	7.268	UU	120983	.282	5	392.725	ETHYLBENZENE
	7.670	UU	42048	.175		135.000	m+p-Xylene
	7.894	UU	88864	.339	6	236.784	m+p-XYLENE
	8.430	UP	169007	.190		.000	
	9.204	PU	38319	.237	7	123.556	O-XYLENE
	9.544	I UH	35276	.255		.000	

TOTAL AREA=7944448
MUL FACTOR=2.0000E+00

GRP#	ug/L	NAME
1	4.0956E+02	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [1.0000E+01]: .25
RECALIBRATION [Y/N*]:
NAME: BLANK-03
REPORT MEMO: PH-222

*
* RUN # 12 OCT 7, 1991 16:24:48
START

IF

STOP

PUN# 12

OCT 7, 1991 16:24:48

SAMPLE NAME: BLANK-03

SIGNAL FILE: B:Q3631051.BNC

MATHES RECON MULTIMEDIA ANALYSIS

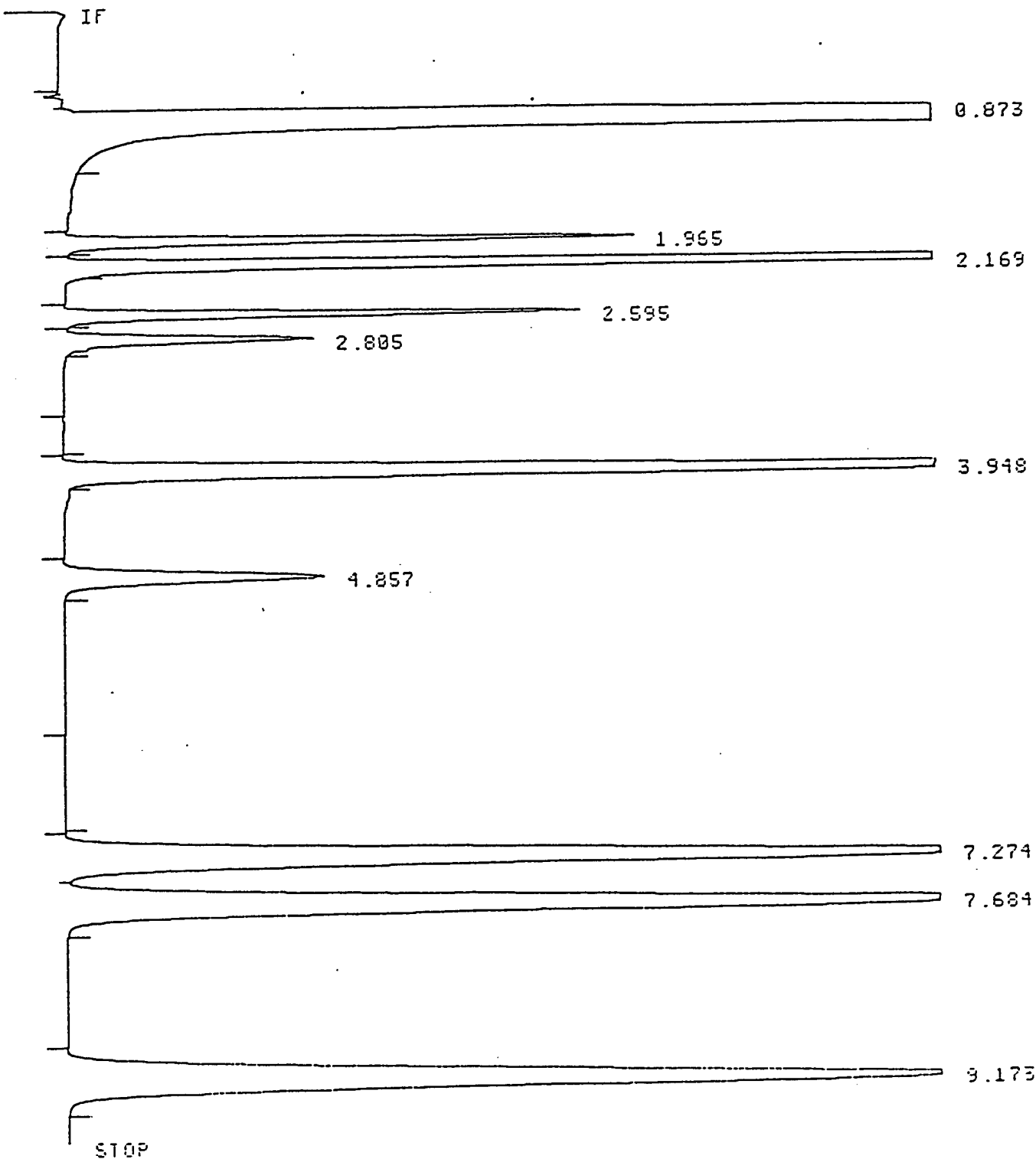
NO RUN PEAKS STORED

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [1.0000E+00]:
RECALIBRATION [Y/N*]:
NAME: RT-01
REPORT MEMO:

* RUN # 14 OCT 7, 1991 16:49:03
START



Closing signal file B:03631600.BNC

SAMPLE NAME: RT-01

SIGNAL FILE: B:03631600.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CALC	ug/L	NAME
.073	SHB	27001440	.051		.000	
1.965	PB	71068	.056		.000	
2.169	BB	330730	.052	1	466.685	BENZENE
2.595	PB	66477	.058	2	458.019	TCE
2.805	PB	39011	.072	3R	.000	INT. STD.
3.948	PB	298462	.082	4	459.967	TOLUENE
4.857	PB	57835	.101		.000	
7.274	PV	313070	.137	5	508.130	ETHYLBENZENE
7.684	UB	329346	.143	6	529.990	M&P-XYLENE
9.173	PB	335121	.167	7	540.284	O-XYLENE

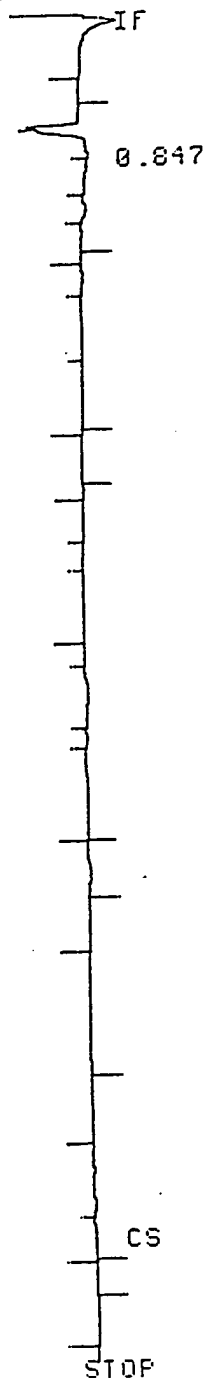
TOTAL AREA=2.8923E+07
MUL FACTOR=1.0000E+00

GRP#	ug/L	NAME
1	1.0703E+03	TOTAL XYLENES

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [1.0000E+00]: .25
RECALIBRATION [Y/N*]:
NAME: BLANK-04
REPORT MEMO:

* RUN # 15 OCT 8, 1991 07:16:06
START



Closing signal file B:Q363E137.SNC

PUNH 15 OCT 8, 1991 07:16:06

SAMPLE NAME: BLANK-04

SIGNAL FILE: B:Q363E137.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

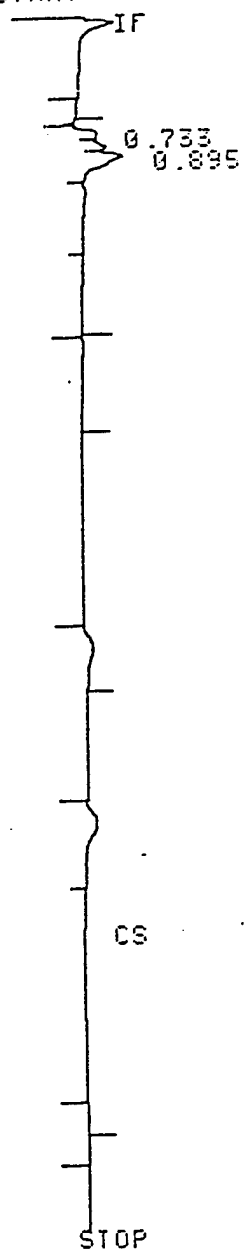
AREA%	RT	AREA	TYPE	WIDTH	AREA%
	.847	10106	BU	.141	25.00000

TOTAL AREA= 10106
MUL FACTOR=2.5000E-01

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N]:
NAME: BLANK-05
REPORT MEMO:

* RUN # 18 OCT 8, 1991 08:05:03
START



Closing signal file B:Q363ECB0.BNC

SAMPLE NAME: BLANK-05

SIGNAL FILE: B:Q363ECB0.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

AREA%

RT	AREA	TYPE	WIDTH	AREA%
.733	2919	BU	.065	5.36169
.895	8552	UU	.098	18.63830

TOTAL AREA= 11471

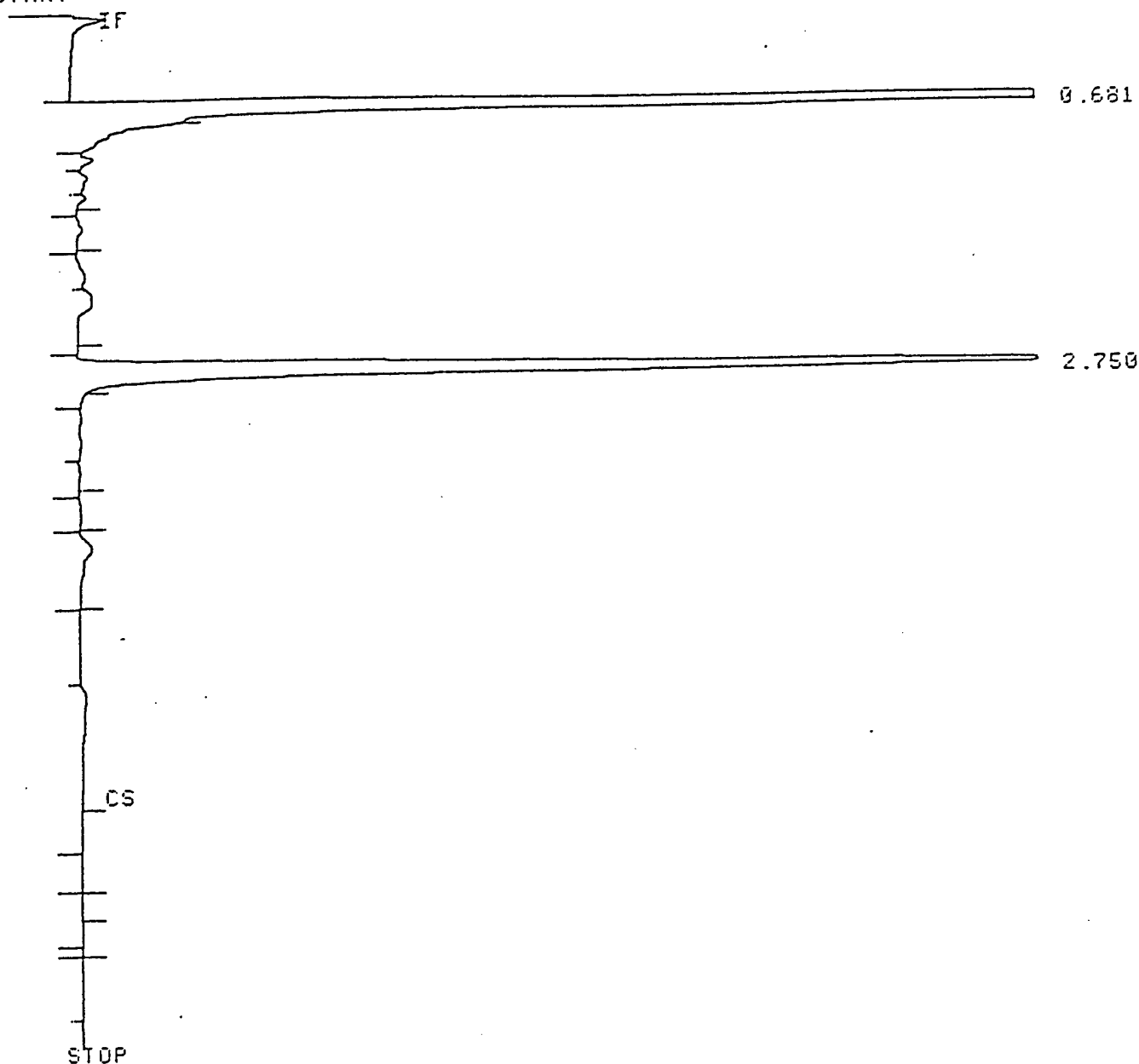
MUL FACTOR=2.5000E-01

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-05
REPORT MEMO: PH-05

* RUN # 19 OCT 8, 1991 08:57:47
START



Closing signal file B:Q363F900.ENC

RUN # 19-002

SAMPLE NAME: GW-05
PH-05

SIGNAL FILE: B:Q363F90C.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.681	PB	467700	.050		.000	
2.750	PB	193914	.086	3R	.000	INT.STD.

TOTAL AREA= 661614
MUL FACTOR=2.5000E-01

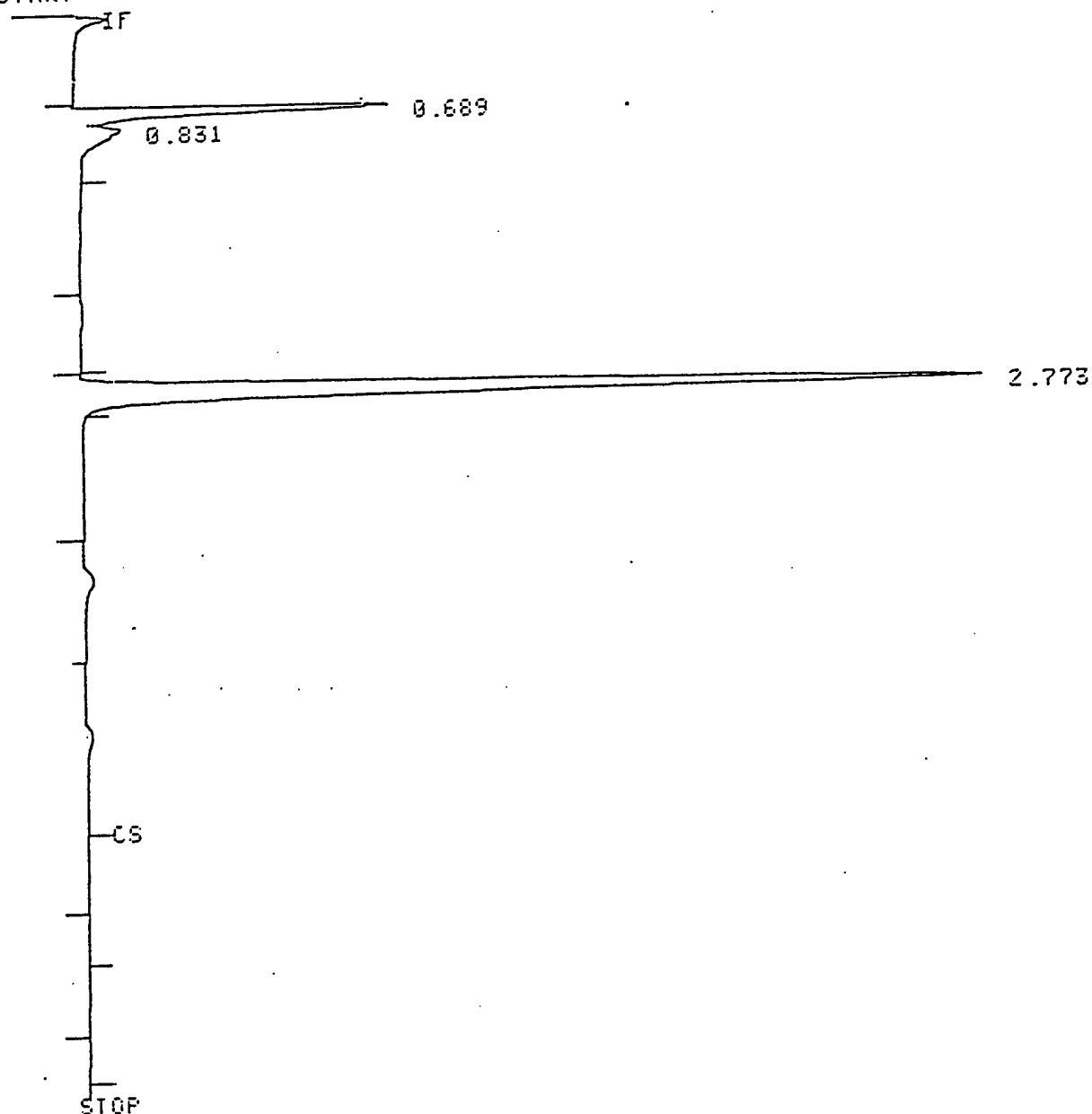
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-06
REPORT MEMO: PH-06

* RUN # 20 OCT 8, 1991 10:09:39
START



Closing signal file B:Q36409E4.BNC

RUN# 27

OCT 8, 1991 15:43:03

SAMPLE NAME: GW-13
PH-13

SIGNAL FILE: S:Q3645800.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.690	PV	166080	.062		.000	
.815	UV	26657	.064		.000	
.944	UV	160558	.072		.000	
1.117	UV	9268	.069		.000	
1.247	UV	174431	.084		.000	
1.403	UV	22550	.064		.000	
1.605	UV	87859	.105		.000	
1.980	UV	88901	.106		.000	
2.179	UB	423715	.095	1	167.764	BENZENE
2.765	PB	230514	.109	SR	.000	INT.STD.
3.131	BU	132817	.100		.000	
3.265	UV	191772	.117		.000	
3.510	UP	6518	.097		.000	
3.758	PP	43936	.131		.000	
4.111	PV	9306	.160		.000	
4.328	UV	7593	.119		.000	
5.568	PV	17465	.363		.000	
7.649	PB	41234	.205	-	14.300	MSP XYLENE
8.022	BS	1329	.049		.000	

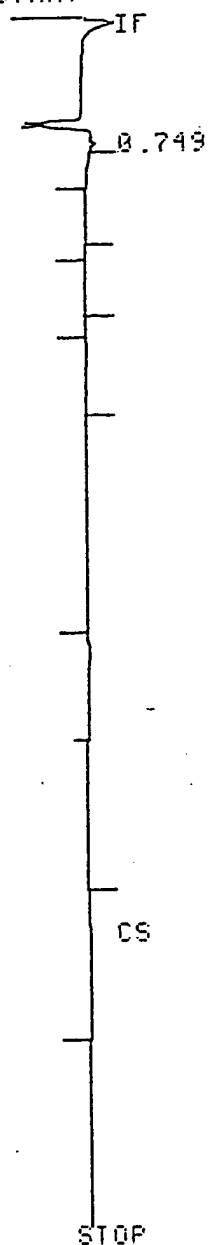
TOTAL AREA=1842503
MUL FACTOR=2.5000E-01

GRP#	ug/L	NAME
1	1.4368E+01	TOTAL XYLENES

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N]:
NAME: BLANK-06
REPORT MEMO:

* RUN # 28 OCT 8, 1991 16:00:04
START



Closing signal file 8:Q3645005.BNC

DATE 09/01/91

09/01/91 10:00:00

SAMPLE NAME: BLANK-06

SIGNAL FILE: B:Q3645C05.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

RT	AREA	TYPE	WIDTH	AREAX
.749	5347	BB	.096	25.00000

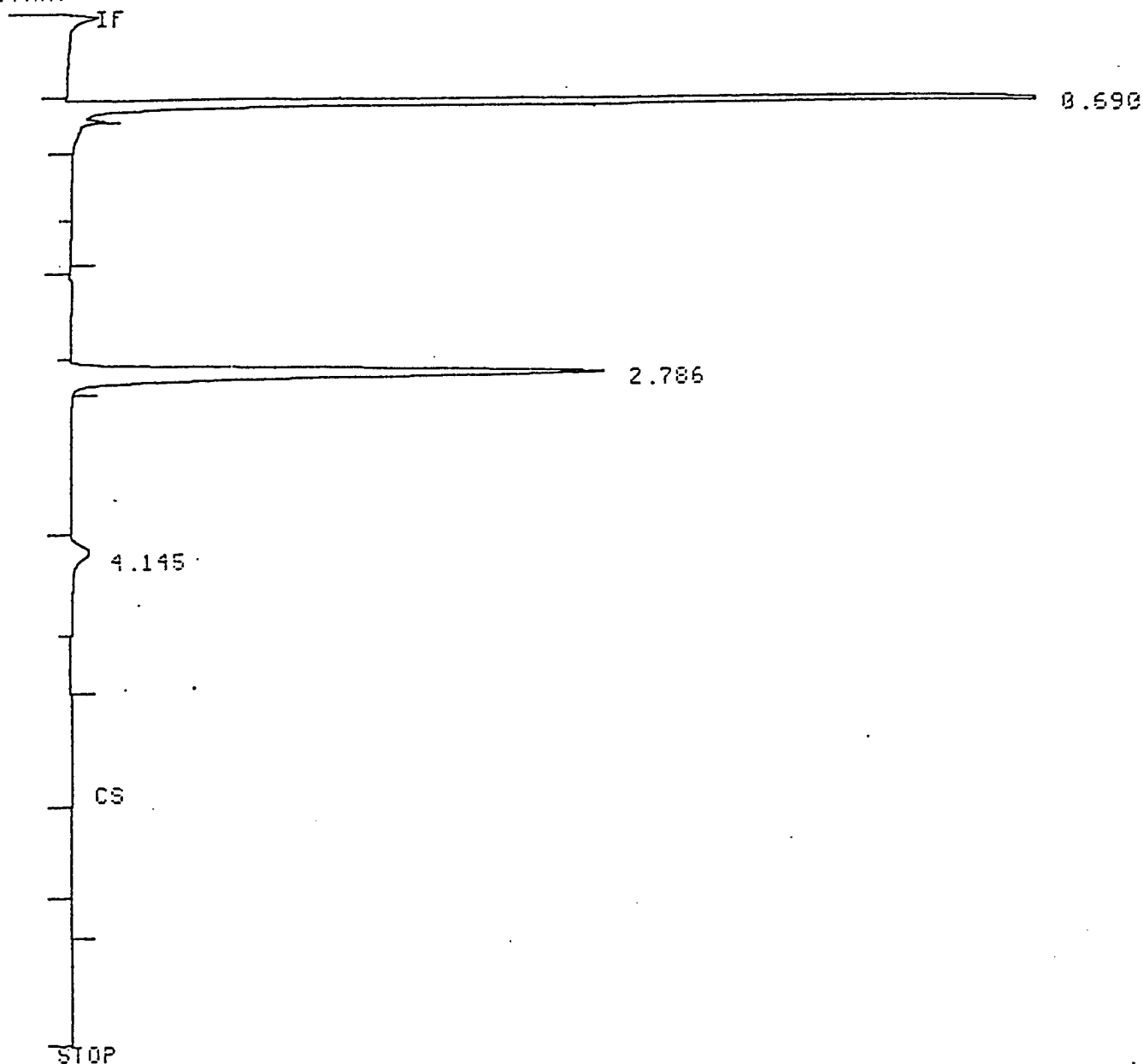
TOTAL AREA= 5347
MUL FACTOR=2.5000E-01

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-14
REPORT MEMO: PH-14

* RUN # 29 OCT 8, 1991 16:29:02
START



Closing signal file B:Q3648107.BNC

SAMPLE NAME: GW-14
PH-14

SIGNAL FILE: B:Q36462CF.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.690	PB	118099	.045		.000	
2.786	PB	87224	.082	3R	.000	INT.STD.
4.145	BP	5427	.143		.000	

TOTAL AREA= 210750
MUL FACTOR=2.5000E-01

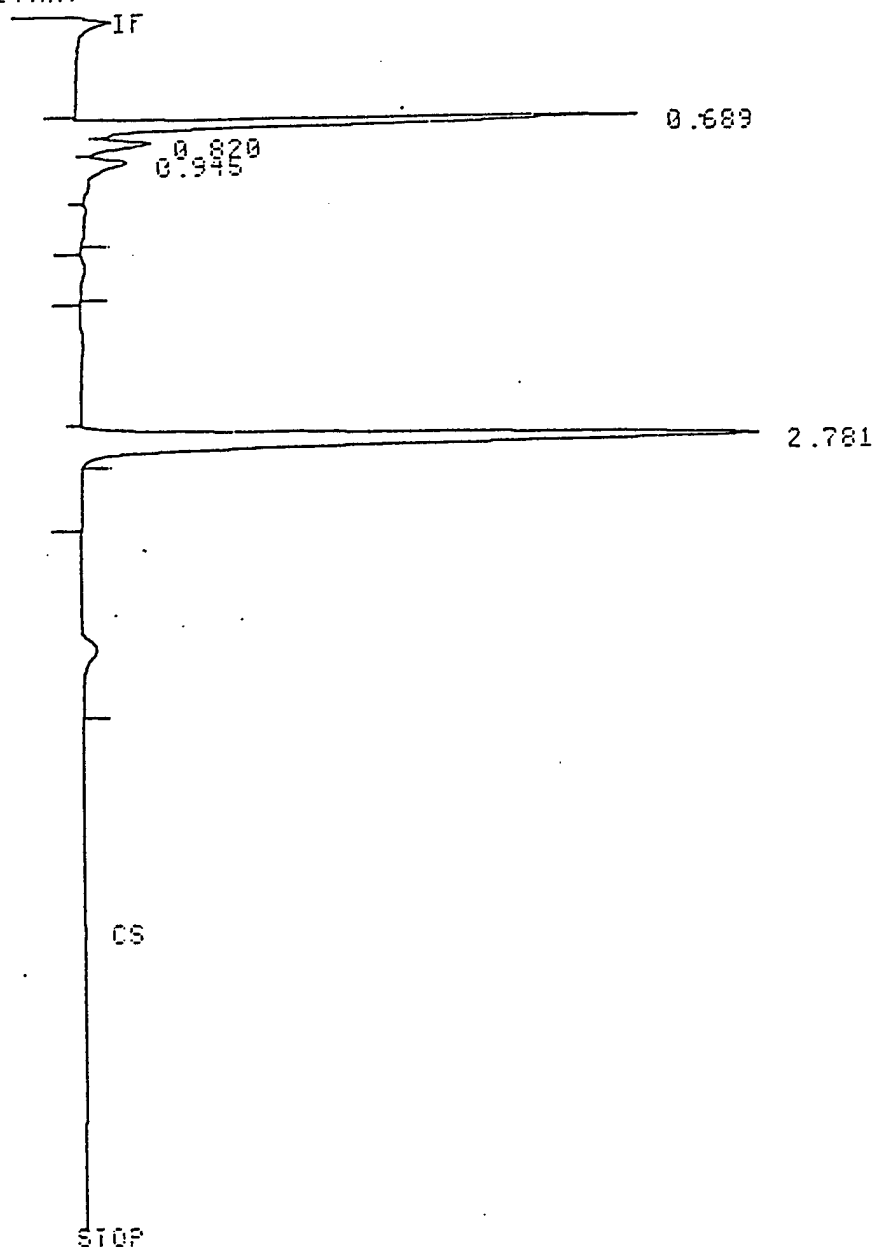
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ GP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT C0.0000E+00 J:
SAMPLE AMT C0.0000E+00 J:
MUL FACTOR C2.5000E-01 J:
RECALIBRATION [Y/N*]:
NAME: GW-140
REPORT MEMO: PH-14

* RUN # 30 OCT 8, 1991 16:41:30
START



Closing signal file B:Q364658C.BNC

RUN = 7 000

RUN# 50

Oct 8, 1991 15:41:50

SAMPLE NAME: GW-140
PH-14

SIGNAL FILE: B:Q364658C.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.689	FU	45786	.043		.000	
.820	UU	8905	.067		.000	
.945	UU	9866	.107		.000	
2.781	PB	98259	.085	3R	.000	INT.STD.

TOTAL AREA= 162816
MUL FACTOR=2.5000E-01

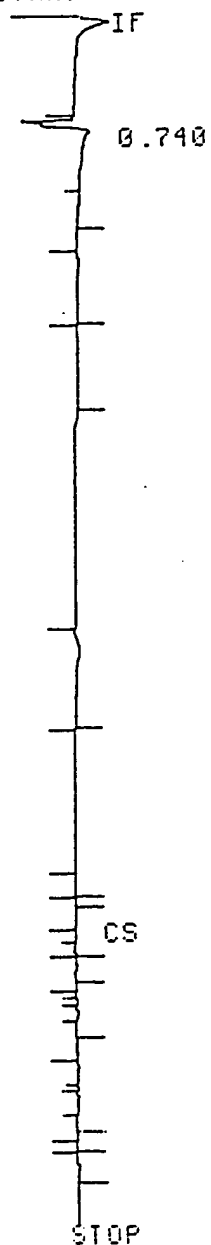
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ GP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N]:
NAME: BLANK-07
REPORT MEMO:

* RUN # 31 OCT 8, 1991 16:54:08
START



Closing signal file B:Q3646881.BNC

SAMPLE NAME: BLANK-07

SIGNAL FILE: B:Q3646001.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

AREA%

RT	AREA	TYPE	WIDTH	AREA%
.740	1951	PV	.061	25.00000

TOTAL AREA= 1951

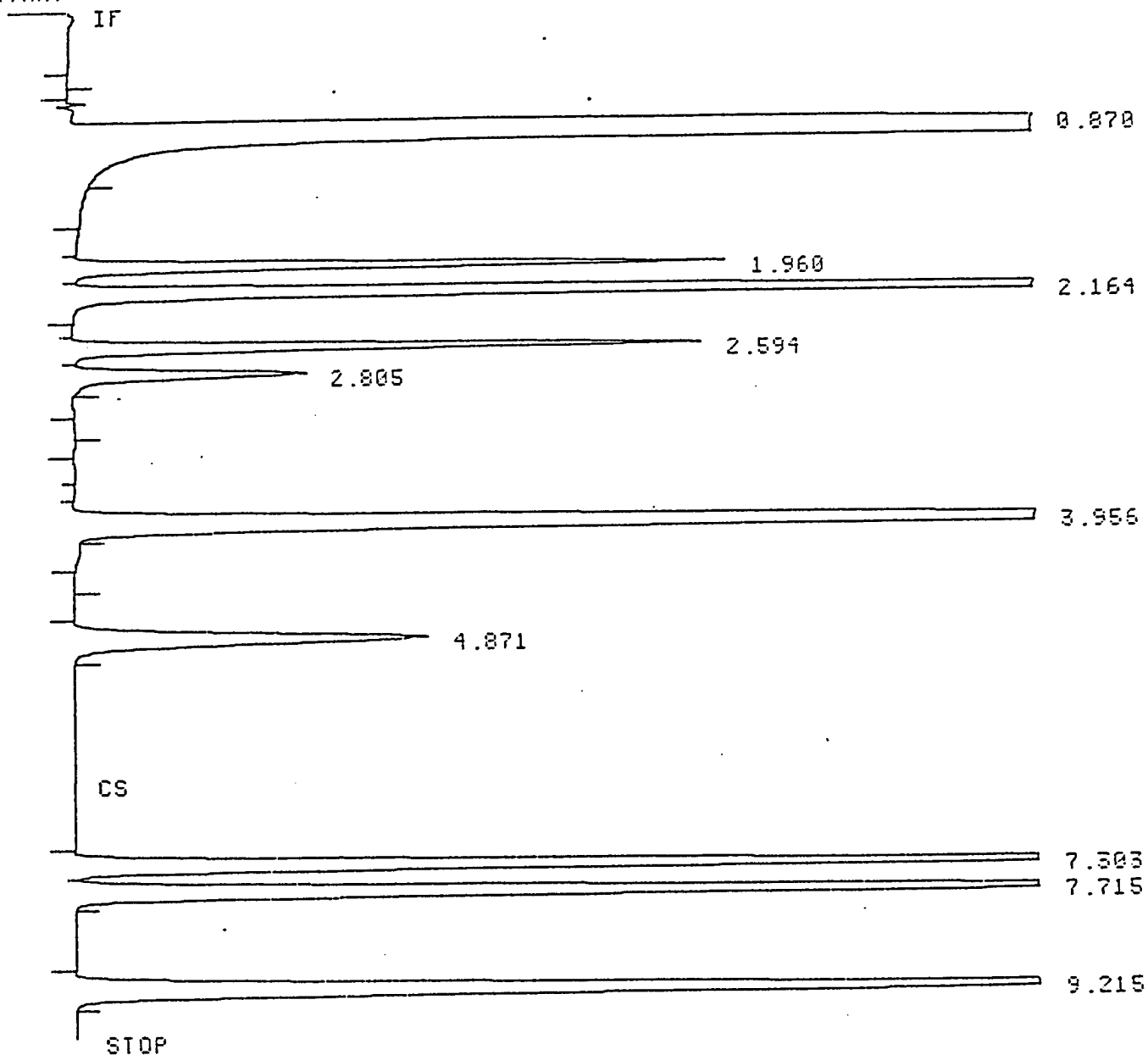
MUL FACTOR=2.5000E-01

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]: 1
RECALIBRATION [Y/N*]:
NAME: RT-02
REPORT MEMO:

* RUN # 32 OCT 8, 1991 17:05:24
START



Closing signal file: 8:03646855.BNC

SAMPLE NAME: RT-02

SIGNAL FILE: B:Q3646B55.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.870	SBB	32647792	.031		.000	
1.960	PP	74315	.057		.000	
2.164	PB	316196	.052	1	500.775	BENZENE
2.594	PV	74970	.059	2	506.960	TCE
2.805	UB	35025	.075	3R	.000	INT.STD.
3.956	PB	325717	.082	4	504.934	TOLUENE
4.871	BB	70946	.100		.000	
7.303	PV	375398	.137	5	540.314	ETHYLBENZENE
7.715	UB	397295	.143	6	553.761	M&P-XYLENE
9.215	PB	411078	.168	7	554.828	O-XYLENE

TOTAL AREA=3.4729E+07

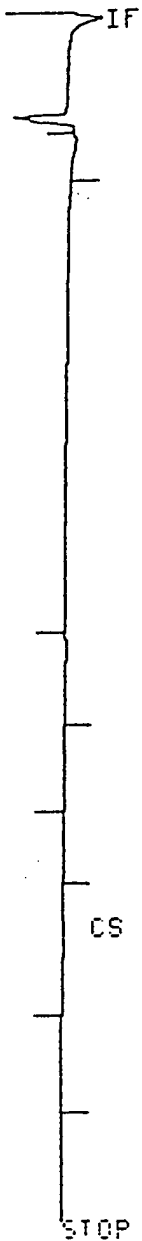
MUL FACTOR=1.0000E+00

GRP#	ug/L	NAME
1	1.1086E+03	TOTAL XYLENES

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N+]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [1.0000E+00]: .25
RECALIBRATION [Y/N+]:
NAME: BLANK-08
REPORT MEMO: '

* RUN # 33 OCT 9, 1991 07:13:21
START



Closing signal file B:Q3653212.BNC

RUN# 33

OCT 9, 1991 07:13:21

SAMPLE NAME: BLANK-08

SIGNAL FILE: B:Q3653212.BNC

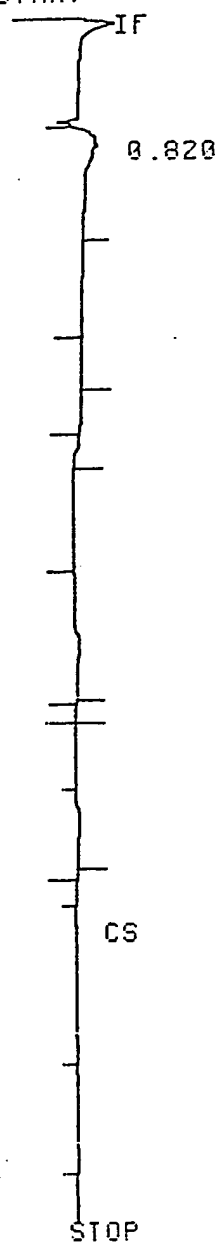
MATHES RECON MULTIMEDIA ANALYSIS

NO RUN PEAKS STORED

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N+]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N+]:
NAME: BLANK-009
REPORT MEMO:

* RUN # 35 OCT 9, 1991 08:11:40
START



Closing signal file B:Q3653FBD.BNC

RUN# 35 OCT 9, 1991 08:11:40

SAMPLE NAME: BLANK-009

SIGNAL FILE: B:Q3653FBO.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

RT	AREA	TYPE	WIDTH	AREA%
.820	10480	BB	.257	25.00000

TOTAL AREA= 10480
MUL FACTOR=2.5000E-01

RUN# 20

OCT 8, 1991 10:09:39

SAMPLE NAME: GW-06
PH-06

SIGNAL FILE: S:Q36409E4.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.689	PU	36673	.062		.000	
.831	UB	12709	.136		.000	
2.773	PB	149907	.088	3R	.000	INT.STD.

TOTAL AREA= 199289
MUL FACTOR=2.5000E-01

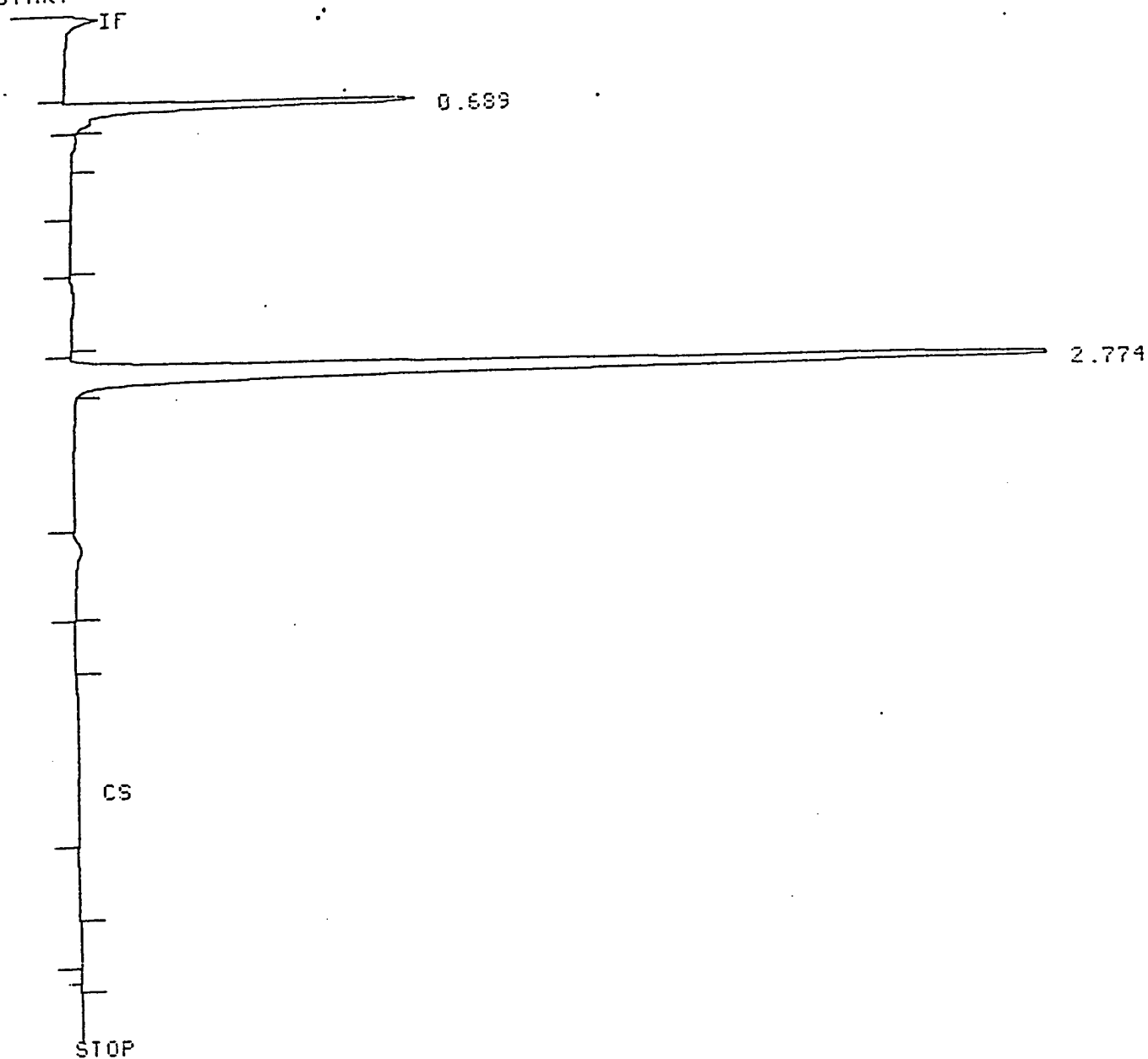
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GU-07
REPORT MEMO: PH-07

* RUN # 21 OCT 8, 1991 10:33:26
START



Closing signal file B:Q3640F77.SMC

RUN# 21

OCT 8, 1991 10:33:26

SAMPLE NAME: GJ-07
PH-07

SIGNAL FILE: B:Q3640F77.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA	RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
	.689	PS	43620	.063		.000	
	2.774	PS	189196	.085	3R	.000	INT.STD.

TOTAL AREA= 232816
MUL FACTOR=2.5000E-01

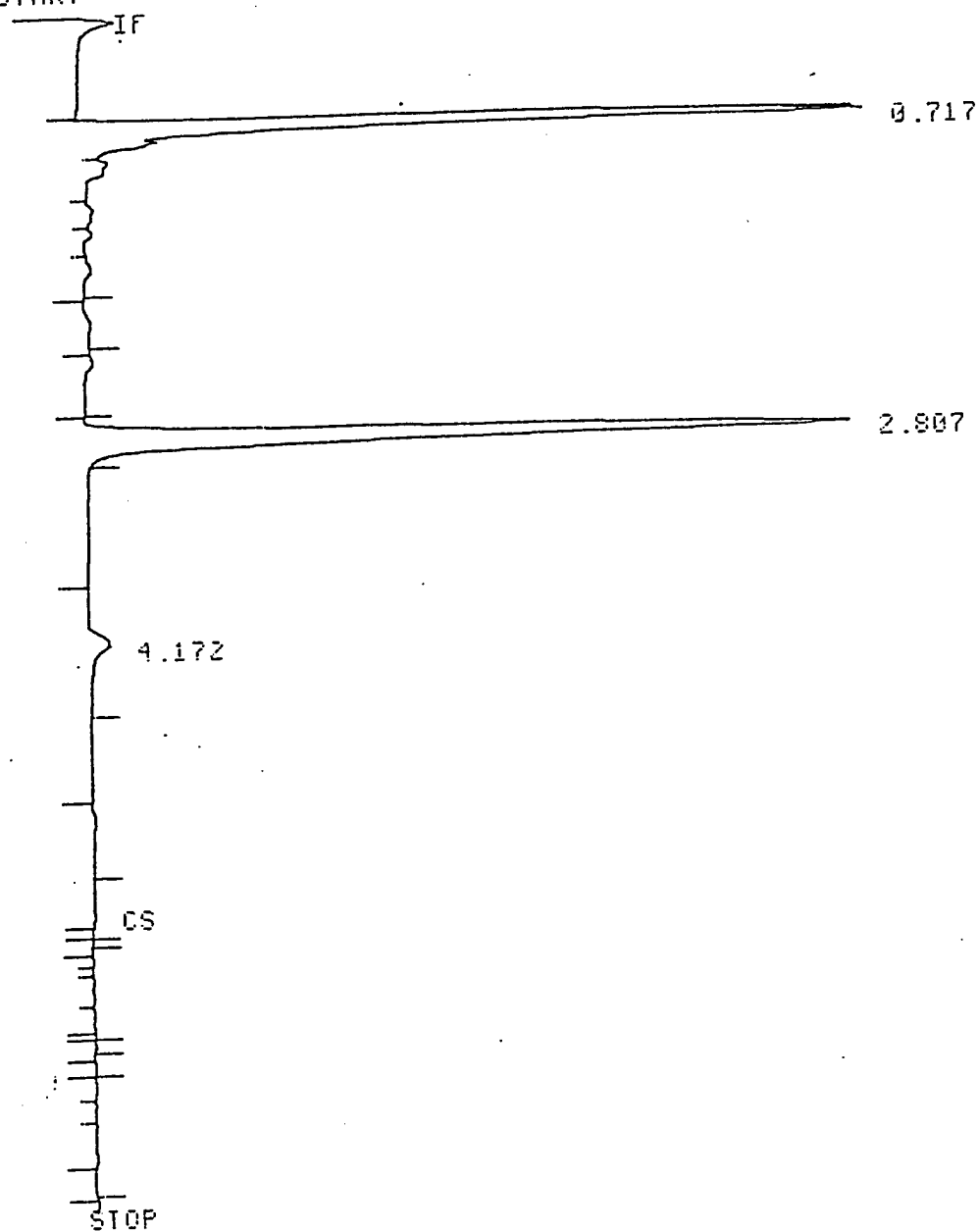
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN (Y/N):

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION (Y/N):
NAME: GW-08
REPORT MEMO: FH-08

* RUN # 22 OCT 8, 1991 12:04:02
START



Closing signal file B:03642483.BNC

22

OCT 8, 1991 12:04:02

NAME: GW-08

L FILE: B:Q3642483.BNC

IES RECON MULTIMEDIA ANALYSIS

RT	AREA	WIDTH	CAL#	ug/L	NAME
.717	99359	.072		.000	
2.807	114726	.087	3R	.000	INT.STD.
4.172	6823	.174		.000	

TOTAL AREA= 220908
MUL FACTOR=2.5000E-01

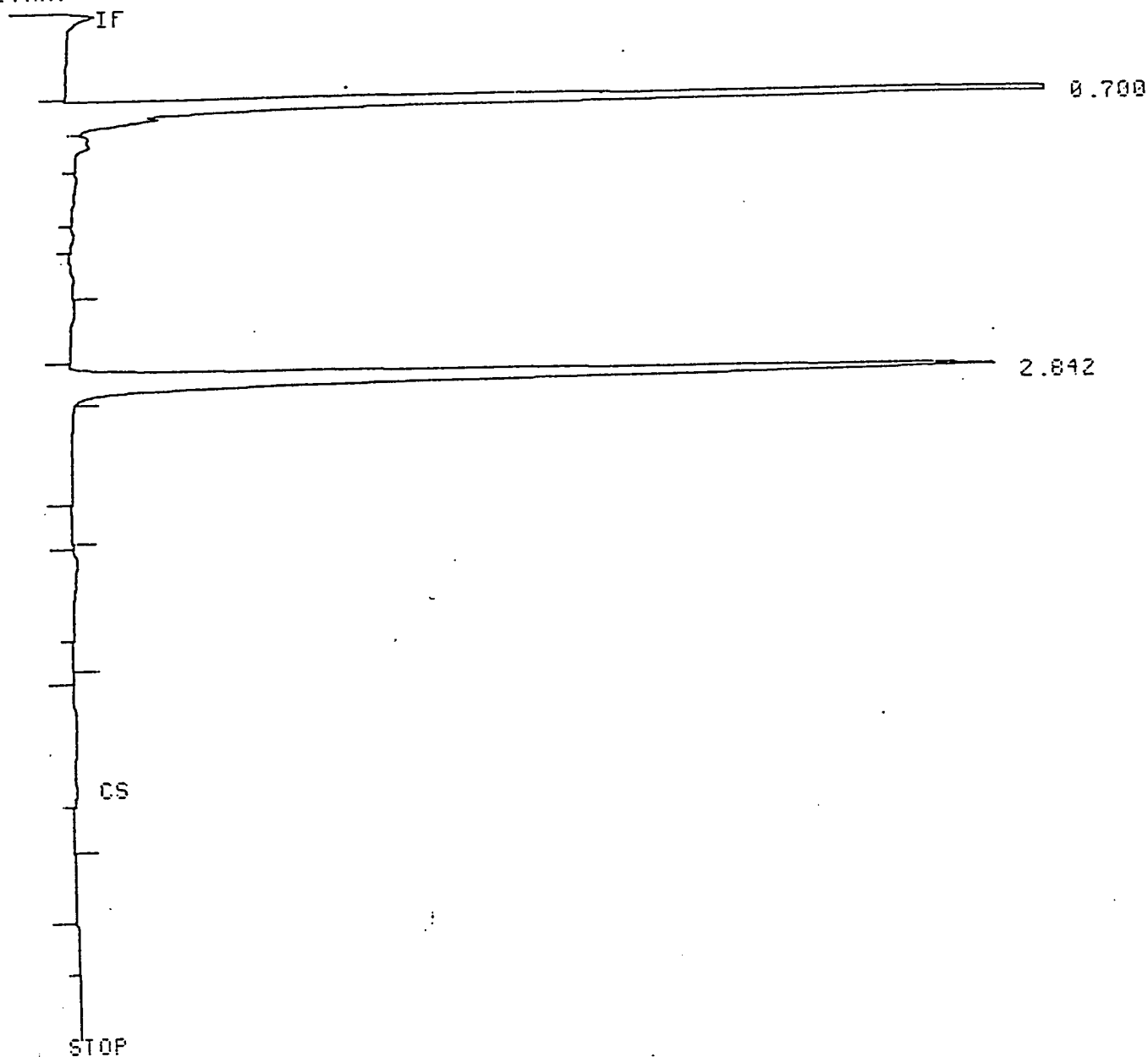
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN CY/N*J:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*J]:
NAME: GW-09
REPORT MEMO: PH-09

* RUN # 23 OCT 8, 1991 13:40:10
START



Closing signal file B:Q3643830.BWD

IN# 25

OCT 8, 1991 13:40:10

SAMPLE NAME: GW-09
PH-09

SIGNAL FILE: B:Q3643B3C.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.700	PV	175726	.063		.000	
2.842	PB	164258	.090	3R	.000	INT.STD.

TOTAL AREA= 339984
MUL FACTOR=2.5000E-01

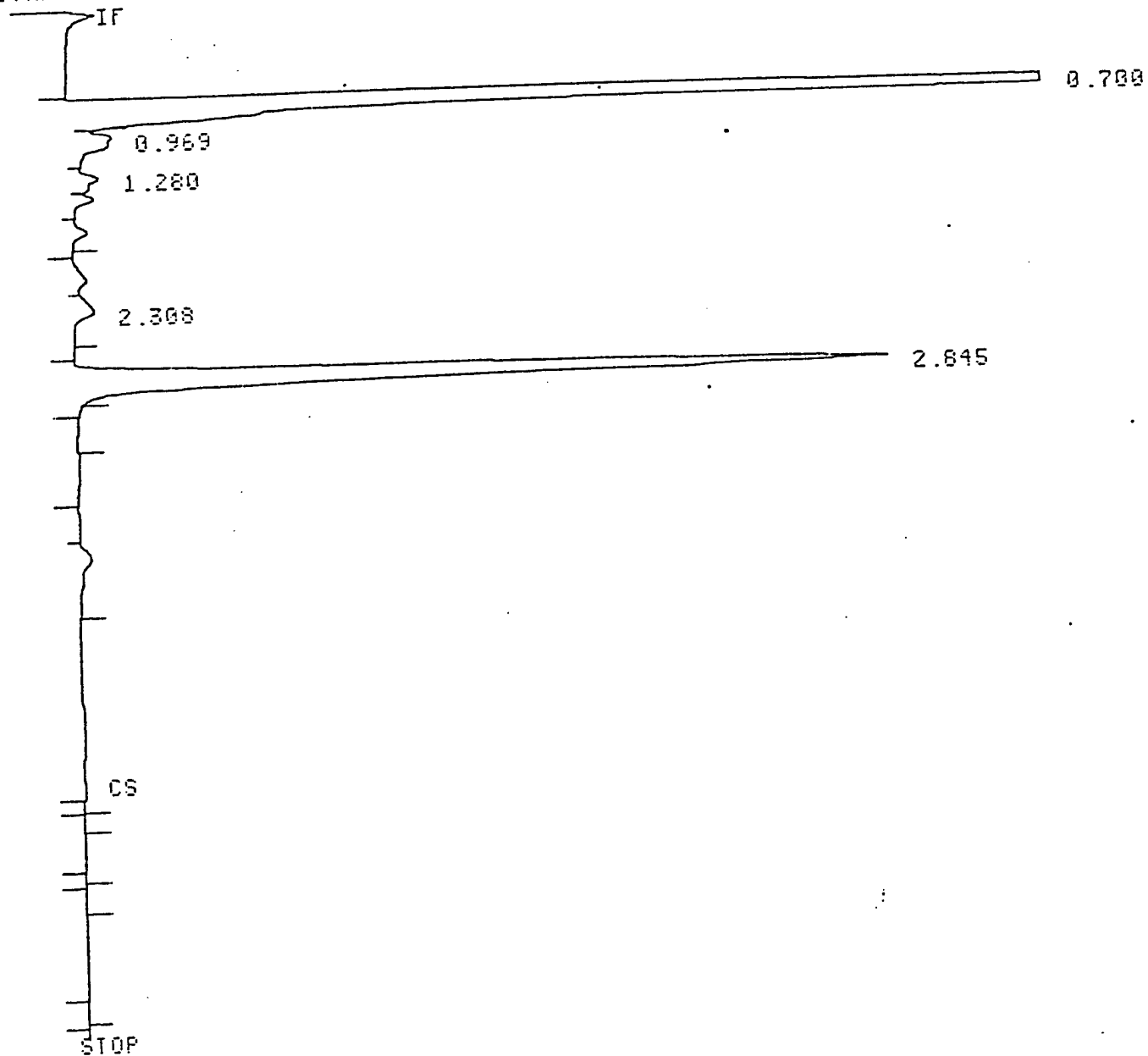
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-10
REPORT MEMO: PH-10

* RUN # 24 OCT 8, 1991 14:12:57
START



Closing signal file B:Q36442EA.BNC

RUN# 24 OCT 8, 1991 14:12:57

SAMPLE NAME: GW-10
PH-10

SIGNAL FILE: B:Q36442EA.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.700	PB	489862	.063		.000	
.969	PP	4949	.108		.000	
1.200	PV	4523	.104		.000	
2.308	VB	7467	.161		.000	
2.845	PB	148413	.092	3R	.000	INT.STD.

TOTAL AREA= 655214
MUL FACTOR=2.5000E-01

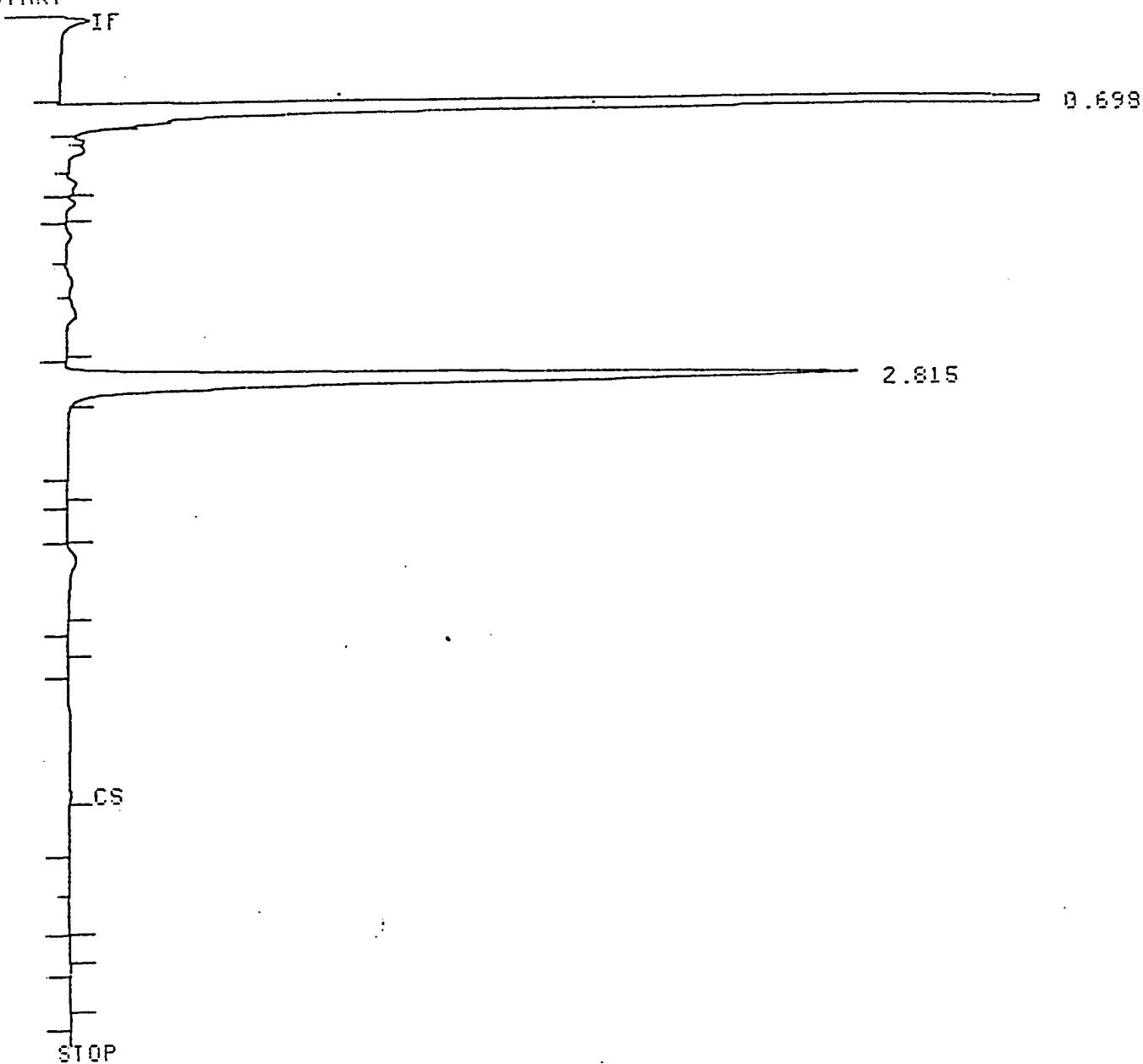
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N]:
NAME: GW-11
REPORT MEMO: PH-11

* RUN # 25 OCT 8, 1991 14:41:32
START



Closing signal file B:Q3644990 END

FILE NAME: GW-11

1

SNAL FILE: B:Q3644990.BNC

ATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.698	PB	321323	.058		.000	
2.815	PB	139508	.089	3R	.000	INT.STD.

TOTAL AREA= 460831

MUL FACTOR=2.5000E-01

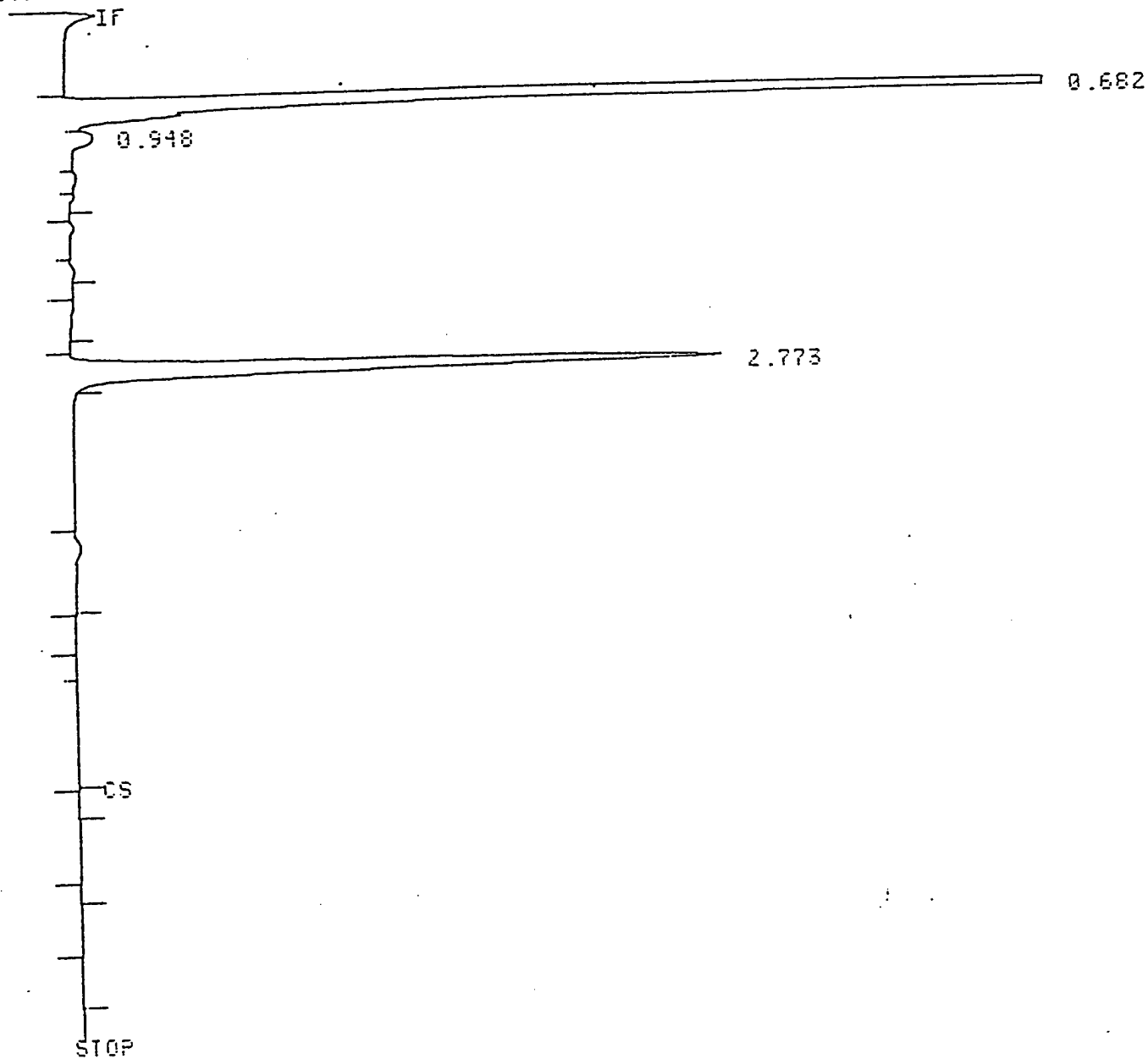
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-12
REPORT MEMO: PH-12

* RUN # 26 OCT 8, 1991 15:12:02
START



Closing signal file 8:Q36450C3.BNC

RUN# 26 OCT 8, 1991 15:12:02

SAMPLE NAME: GW-12
PH-12

SIGNAL FILE: B:Q36450C3.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.682	BV	303820	.061		.000	
.948	UV	7469	.132		.000	
2.773	PB	113302	.088	3R	.000	INT.STD.

TOTAL AREA= 424591
MUL FACTOR=2.5000E-01

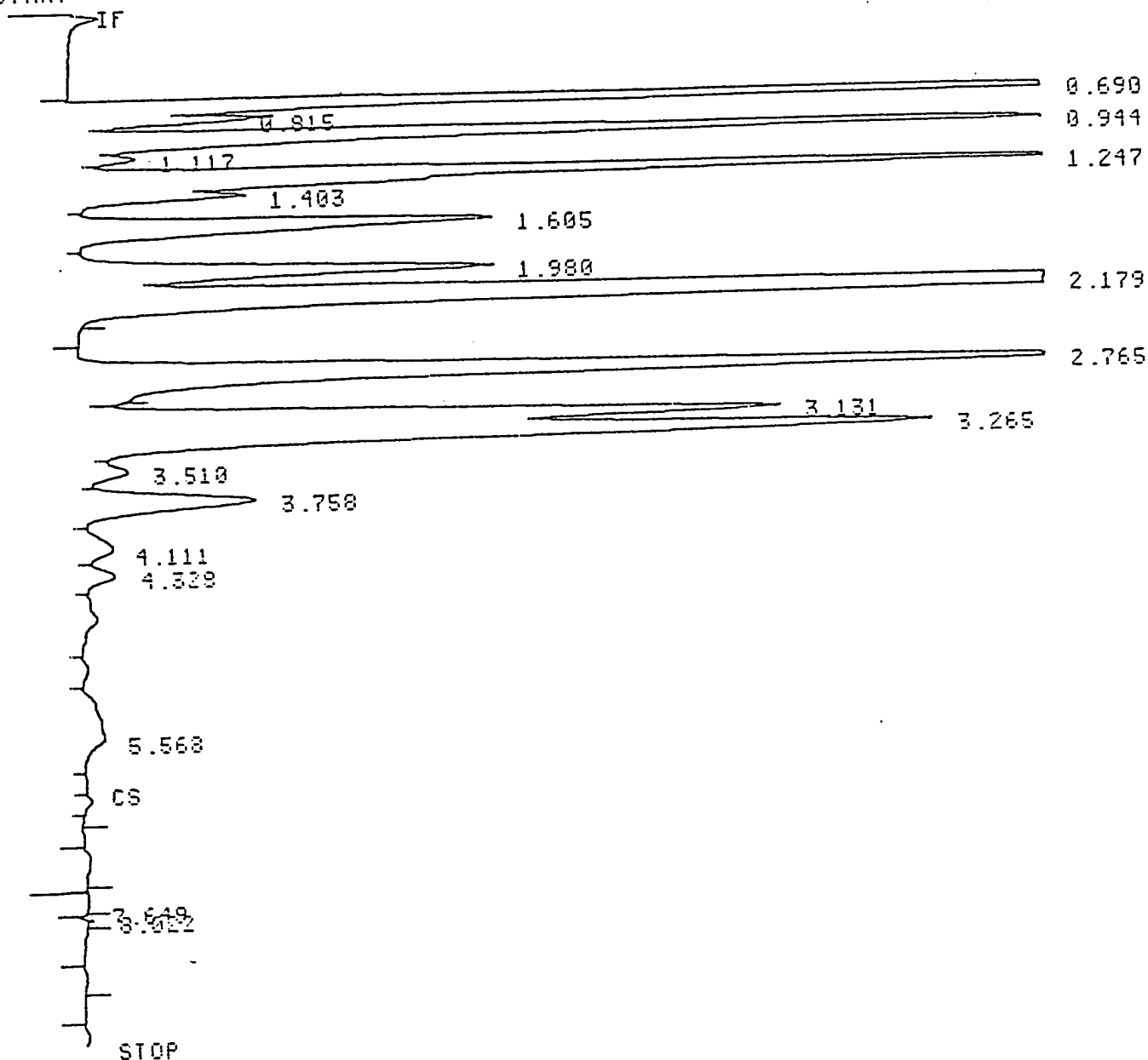
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N]:
NAME: GW-13
REPORT MEMO: PH-13

* RUN # 27 OCT 8, 1991 15:43:03
START



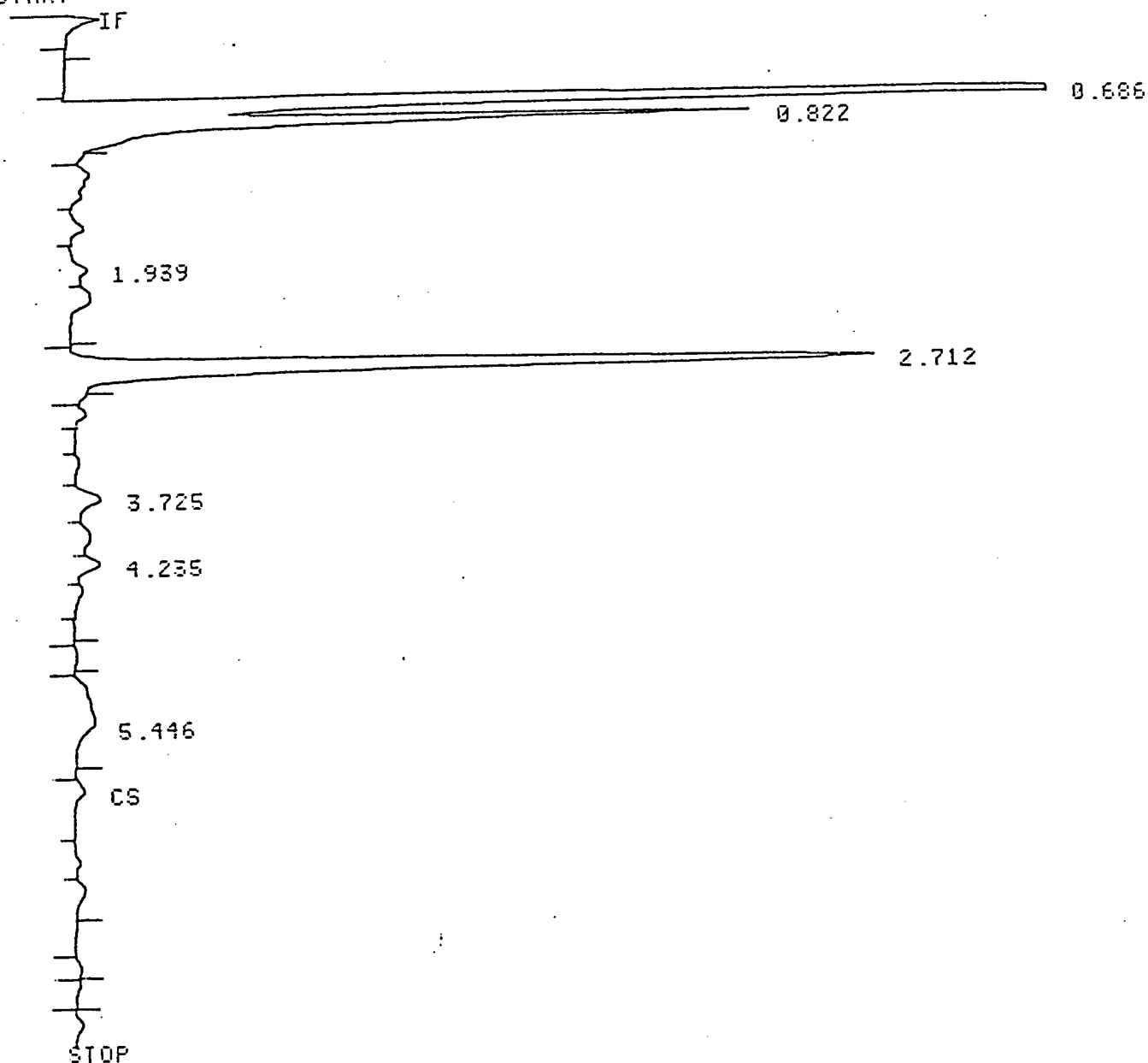
Closing signal file B:Q3645808.DNC

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GGW-15
REPORT MEMO: PH-06

* RUN # 36 OCT 9, 1991 09:05:26
START



Closing signal file B:Q36S4C58.BNC

PUN# 36

OCT 9, 1991 09:05:26

SAMPLE NAME: GGW-15
PH-06

SIGNAL FILE: B:Q3654C58.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

AREA%	RT	AREA	TYPE	WIDTH	AREA%
	.686	172472	PV	.075	9.73272
	.822	96464	UB	.071	5.44354
	1.939	4312	PV	.118	.24333
	2.712	141915	PB	.090	8.00836
	3.725	7100	PV	.129	.40066
	4.235	6699	UU	.127	.37803
	5.446	14059	BB	.338	.79336

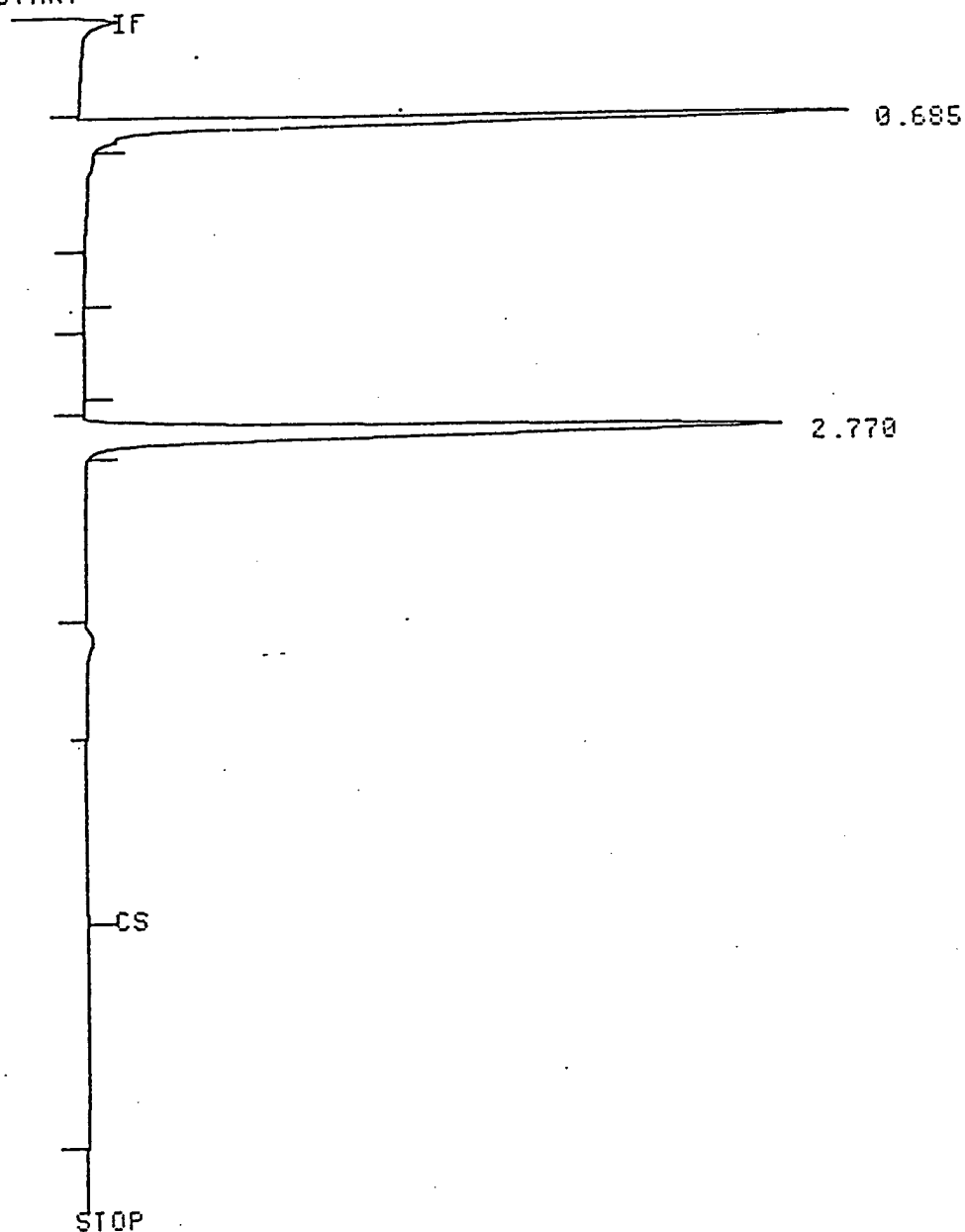
TOTAL AREA= 443021
MUL FACTOR=2.5000E-01

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-16
REPORT MEMO: PH-06

* RUN # 37 OCT 9, 1991 09:30:44
START



Closing signal file B:Q3655246.BNC

RUN# 37

OCT 9, 1991 09:30:44

SAMPLE NAME: GW-16
PH-06

SIGNAL FILE: B:Q3655246.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.685	FB	78113	.059		.000	
2.770	FB	104623	.087	3R	.000	INT. STD.

TOTAL AREA= 182736
MUL FACTOR=2.5000E-01

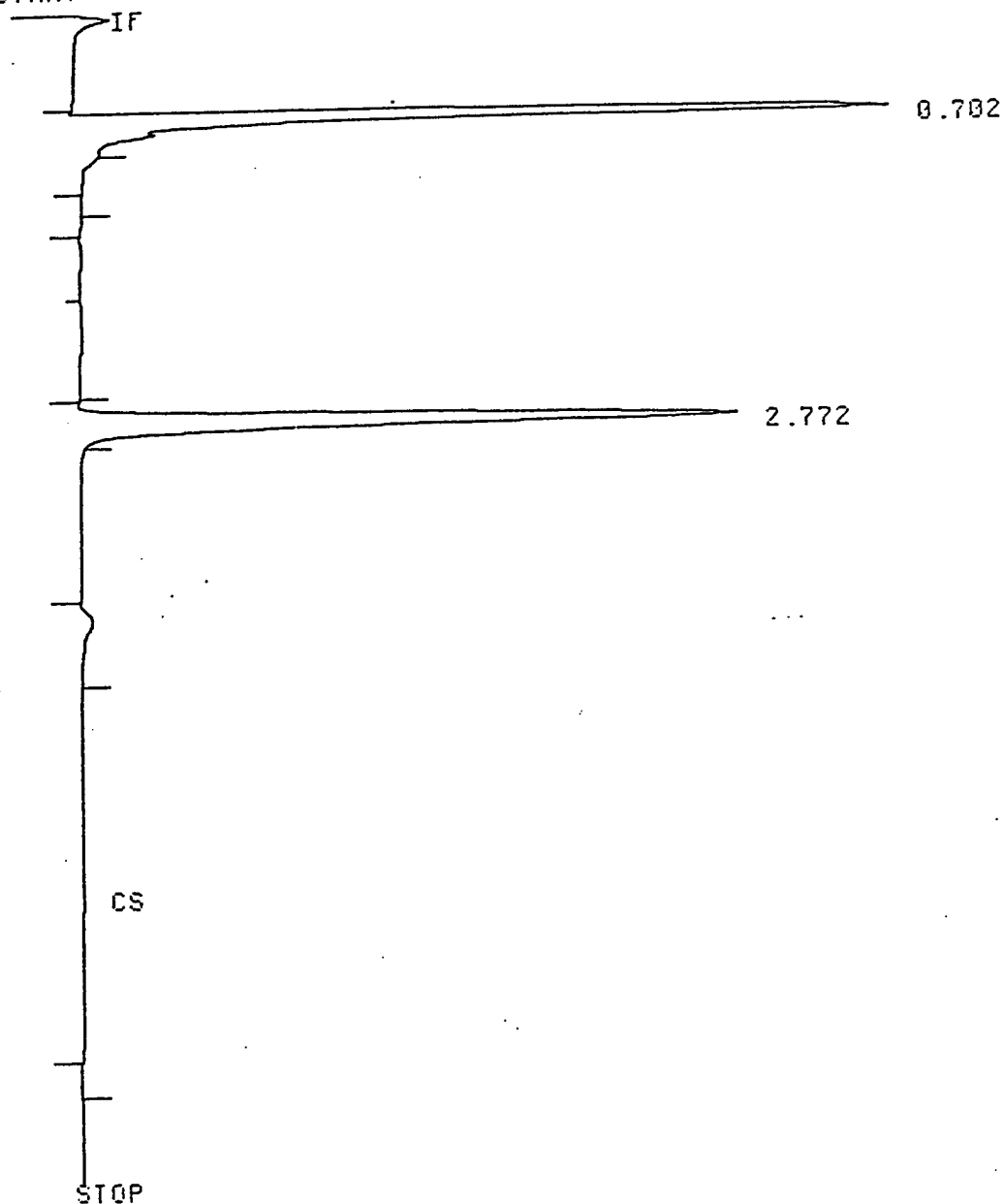
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-17
REPORT MEMO: PH-06

* RUN # 38 OCT 9, 1991 09:50:45
START



Closing signal file B:Q36556F6.SMC

RUN# 38

OCT 9, 1991 09:50:45

SAMPLE NAME: GW-17

PH-06

SIGNAL FILE: B:Q36556F6.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.702	PB	106548	.075		.000	
2.772	PB	101910	.089	3R	.000	INT. STD.

TOTAL AREA= 208458

MUL FACTOR=2.5000E-01

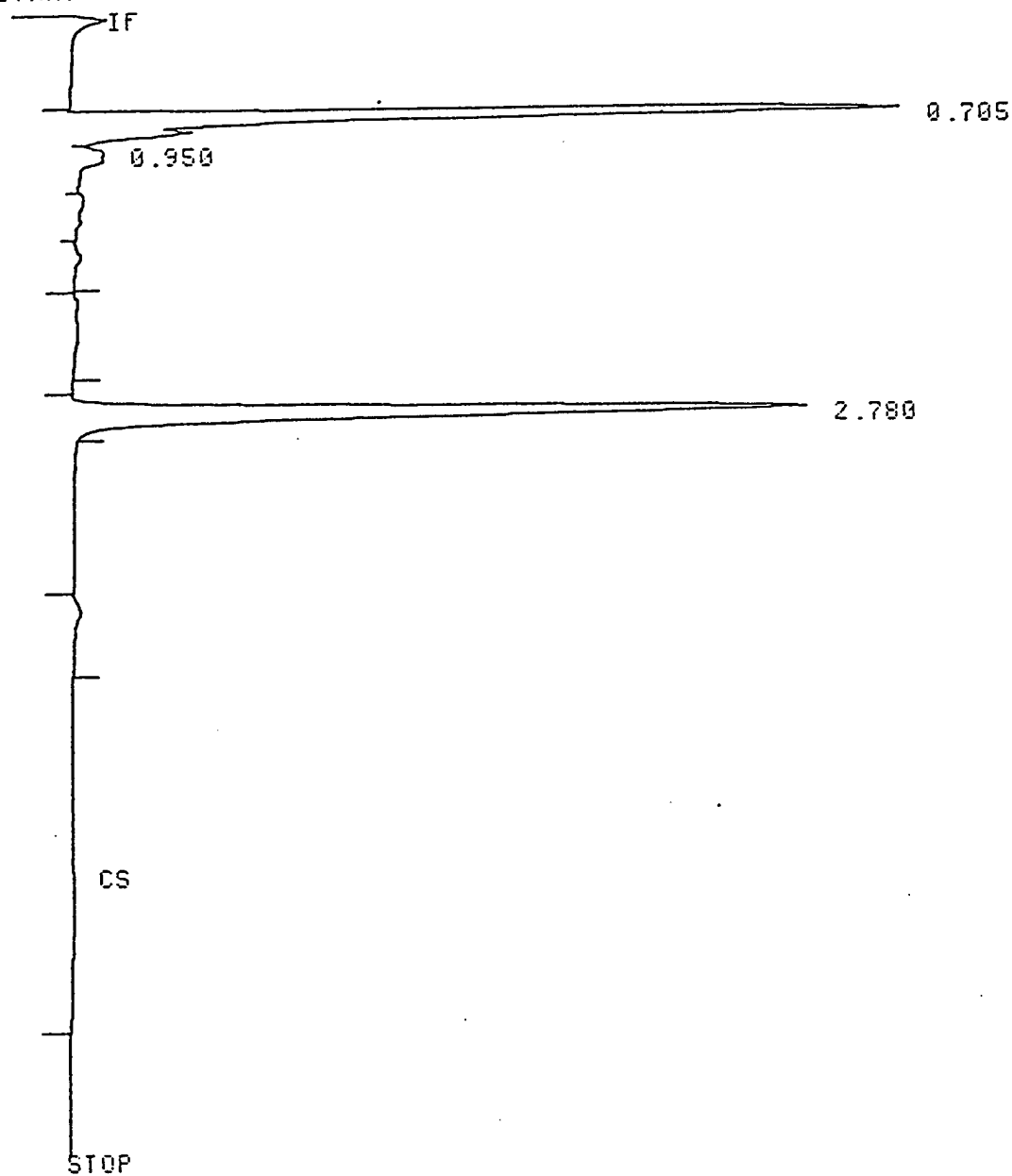
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: GW-18
REPORT MEMO: PH-06

* RUN # 39 . OCT 9, 1991 10:11:29
START



Closing signal file B:Q3655803.BNC

RUN # 39

SAMPLE NAME: GW-18
PH-06

SIGNAL FILE: B:Q3655803.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CL#	ug/L	NAME
.785	PV	118826	.079		.000	
.950	VV	9454	.145		.000	
2.780	PB	115672	.088	3R	.000	INT. STD.

TOTAL AREA= 243952
MUL FACTOR=2.5000E-01

GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

NAME: GU-19

AL FILE: B:Q365718A.BNC

HES RECON MULTIMEDIA ANALYSIS

STD-AREA	RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
	.721	FU	187355	.071		.000	
	2.812	PB	97062	.093	3R	.000	INT. STD.

TOTAL AREA= 284417
MUL FACTOR=2.5000E-01

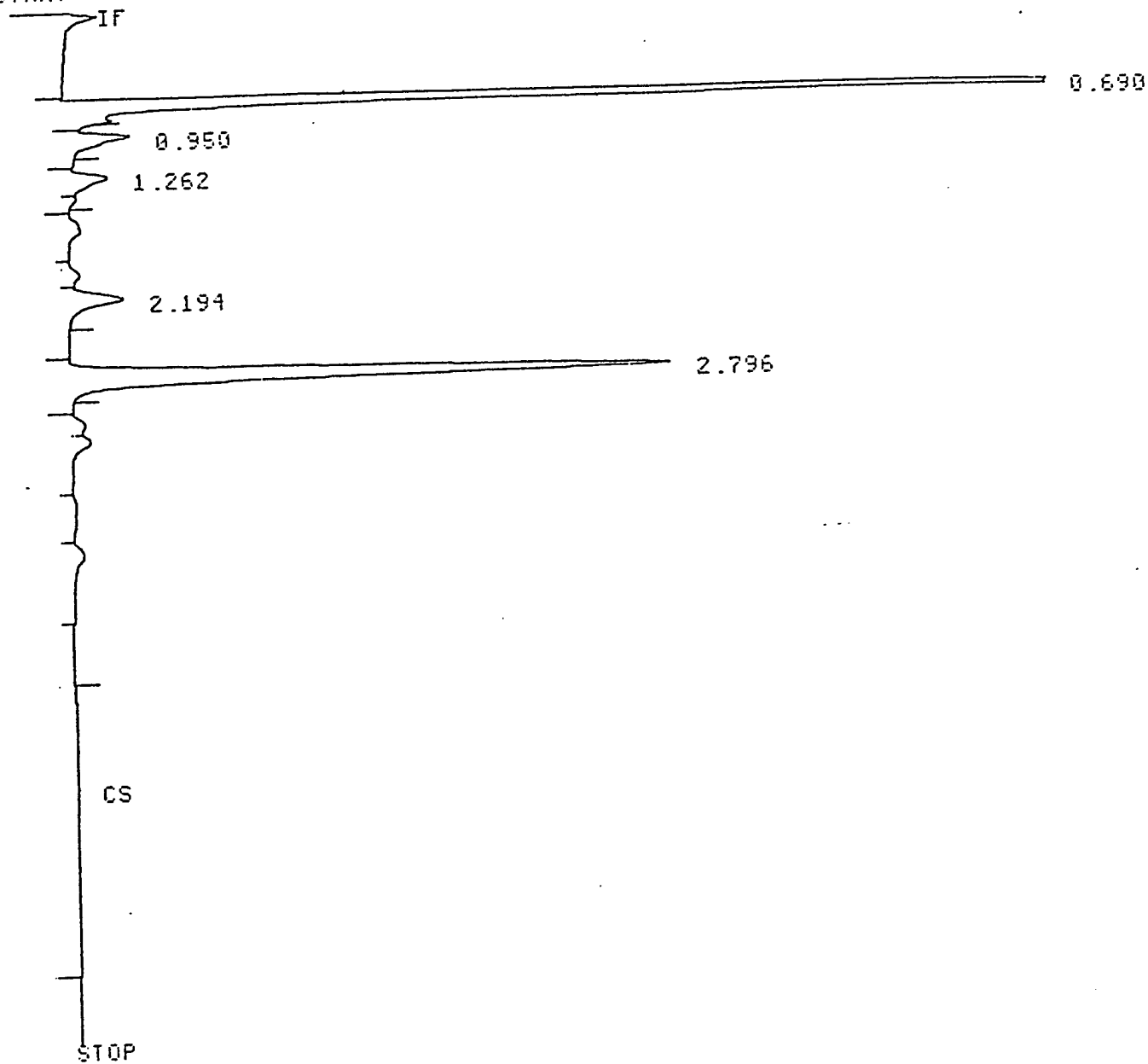
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN (Y/N*):

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.0000E+00]: .25
RECALIBRATION (Y/N*):
NAME: GW-20
REPORT MEMO: PH-16

* RUN # 43 OCT 9, 1991 12:14:56
START



Closing signal file B:Q3657801.BMC

114 43

OCT 9, 1991 12:14:56

SAMPLE NAME: GW-20

H=16

SIGNAL FILE: B:Q36578C1.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.690	PB	136165	.051		.000	
.950	BB	7752	.074		.000	
1.262	PV	6856	.090		.000	
2.194	UB	12185	.110	1	4.373	BENZENE
2.796	PB	106721	.089	3R	.000	INT. STD.

TOTAL AREA= 269679

MUL FACTOR=2.5000E-01

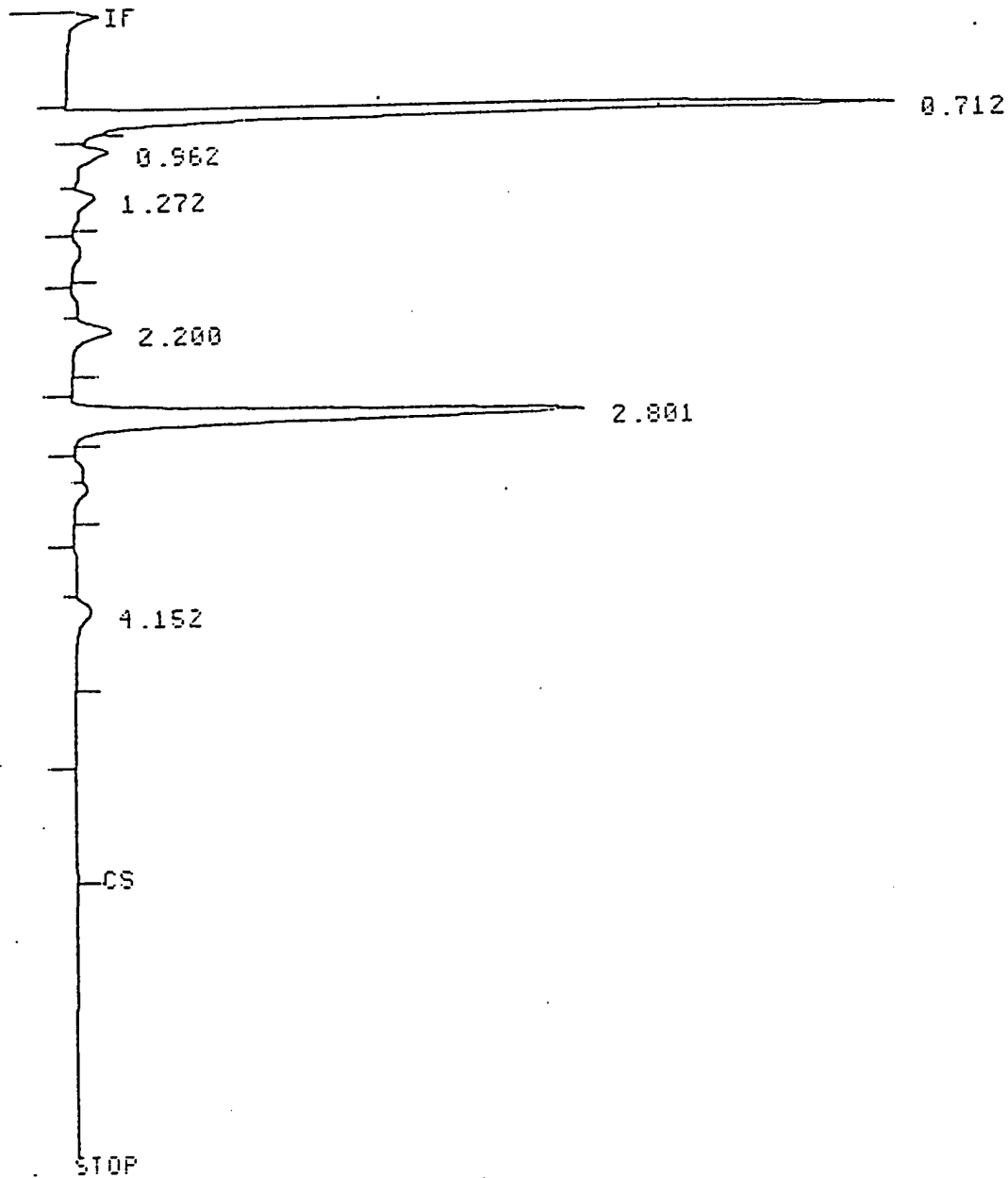
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN CY/N#J:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N#J]:
NAME: GW-200
REPORT MEMO: PH-16

* RUN # 44 OCT 19, 1991 12:27:41
START



Closing signal file B:Q365788E.BNC

RUN# 44 OCT 9, 1991 12:27:41

SAMPLE NAME: GW-200
PH-16

SIGNAL FILE: B:Q3657BBE.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
.712	PB	100928	.068		.000	
.962	BP	3998	.077		.000	
1.272	PB	4420	.105		.000	
2.200	VB	8848	.115	1	3.176	BENZENE
2.801	PB	87658	.095	3R	.000	INT. STD.
4.152	VB	5715	.169		.000	

TOTAL AREA= 211567
MUL FACTOR=2.5000E-01

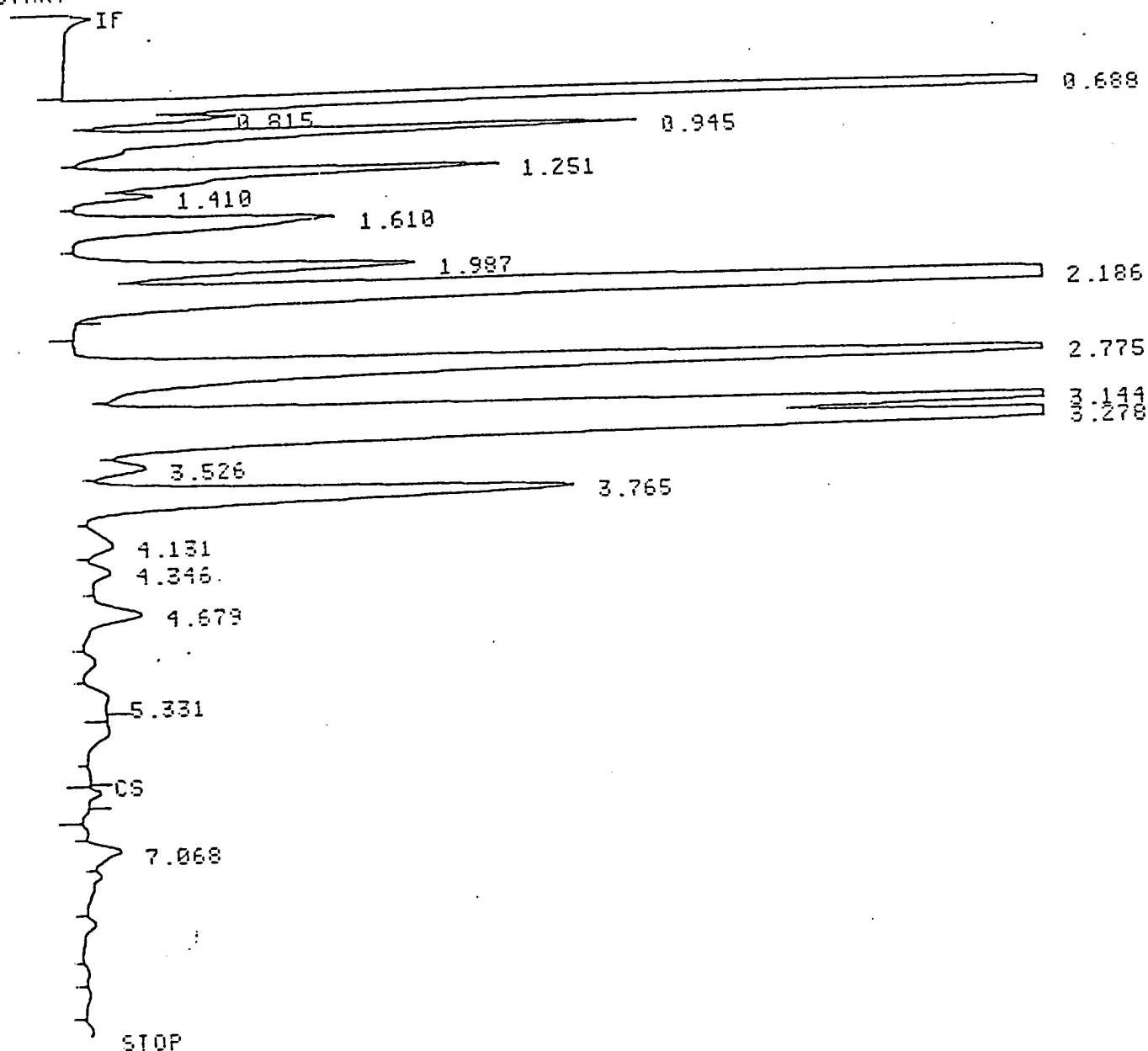
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN CY/N*J:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*J]:
NAME: GW-21
REPORT MEMO: PH-17

* RUN # 45 OCT 9, 1991 12:40:11
START



Closing signal file: B:Q3657EAC.BNC

HA 45

OCT 9, 1991 12:10:11

SAMPLE NAME: GW-21
H-17

SIGNAL FILE: B:Q3657EAC.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA	RT	TYPE	AREA	WIDTH	CAL#	ug/L	NAME
	.688	PV	528259	.047		.000	
	.815	UV	21105	.060		.000	
	.945	UV	88022	.077		.000	
	1.251	UV	71005	.082		.000	
	1.410	UV	11038	.063		.000	
	1.610	UV	58796	.112		.000	
	1.987	UV	68374	.100		.000	
	2.186	VB	479313	.092	1	172.029	BENZENE
	2.775	PV	275309	.119	3R	.000	INT. STD.
	3.144	UV	235747	.103		.000	
	3.278	UV	322150	.118		.000	
	3.526	UV	16869	.118		.000	
	3.765	UV	127435	.128		.000	
	4.131	UV	13022	.181		.000	
	4.346	UV	8604	.132		.000	
	4.679	UV	21776	.175		.000	
	5.331	PB	3104	.118		.000	
	7.068	UV	22007	.269	5	6.299	ETHYLBENZENE

TOTAL AREA=2371934
MUL FACTOR=2.5000E-01

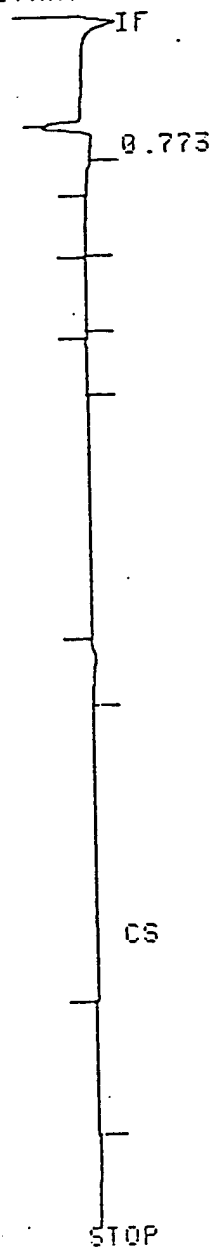
GRP#	ug/L	NAME
1	0.0000E+00	TOTAL XYLENES

+ OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N*]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]:
RECALIBRATION [Y/N*]:
NAME: BLANK-10
REPORT MEMO:

* RUN # 46 OCT 9, 1991 12:57:13
START



Closing signal file B:Q36582AA.BNC

RUN# 45 OCT 9, 1991 12:57:13

SAMPLE NAME: BLANK-10

SIGNAL FILE: B:Q36502AA.BNC

MATHES RECON MULTIMEDIA ANALYSIS

NO CALIB PEAKS FOUND

AREA#

RT	AREA	TYPE	WIDTH	AREA#
.773	7486	PB	.112	25.00000

TOTAL AREA= 7486

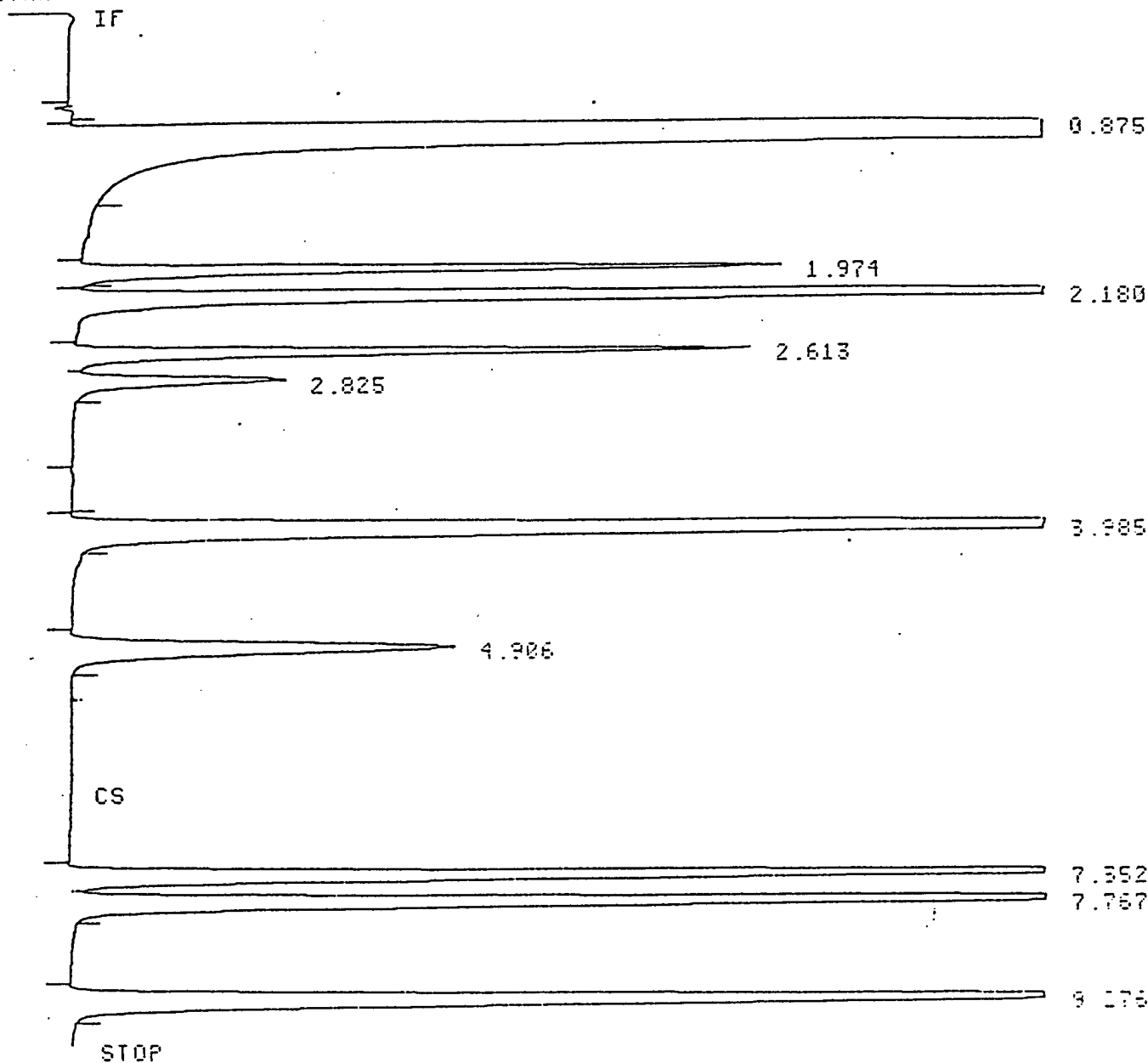
MUL FACTOR=2.5000E-01

* OP # 7

DEFAULT SAMPLE INFORMATION
USE SAMPLE TABLE IN MANUAL RUN [Y/N]:

ISTD AMT [0.0000E+00]:
SAMPLE AMT [0.0000E+00]:
MUL FACTOR [2.5000E-01]: 1
RECALIBRATION [Y/N]:
NAME: RT-03
REPORT MEMO:

* RUN # 47 OCT 9, 1991 13:08:19
START



Closing signal file B:03658544.BWC

SAMPLE NAME: RT-03

SIGNAL FILE: B:Q3658544.BNC

MATHES RECON MULTIMEDIA ANALYSIS

ESTD-AREA

RT	TYPE	AREA	WIDTH	CL#	ug/L	NAME
.875	SB	30938704	.032		.000	
1.974	PB	81848	.059		.000	
2.180	BB	335924	.054	1	482.262	BENZENE
2.613	BU	81725	.061	2	474.573	TCE
2.825	UB	32022	.076	3R	.000	INT. STD.
3.985	PB	334276	.085	4	453.932	TOLUENE
4.906	PB	78471	.103		.000	
7.352	PV	386095	.141	5	442.059	ETHYLBENZENE
7.767	UB	415050	.147	6	440.594	M&P-XYLENE
9.276	PB	430869	.171	7	427.554	O-XYLENE

TOTAL AREA=3.3115E+07

MUL FACTOR=1.0000E+00

GRP#	ug/L	NAME
1	8.6815E+02	TOTAL XYLENES

APPENDIX B-3

**LABORATORY REPORTS FROM 1995 NATURAL ATTENUATION
INVESTIGATION**

MANITTECH TECHNOLOGY

Ref: 95-DK9/vg
May 9, 1995

Dr. Don Kampbell
R.S. Kerr Environmental Research Lab
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74820

THRU: S.A. Vandegrift SV

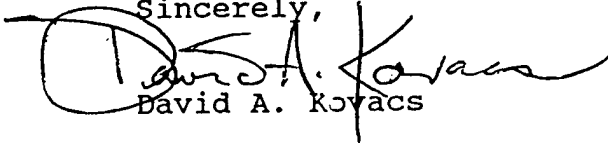
Dear Don:

This report contains the results of my GC/MSD analysis of methylene chloride extracts of core samples and one free floating product sample (MW-5) from Rickenbacker ANGB for quantitation of benzene, trichloroethylene (TCE), tetrachloroethylene (PCE), toluene, ethylbenzene (EB), p-Xylene (p-X), m-Xylene (m-X), o-Xylene (o-X), 1,3,5-trimethylbenzene (1,3,5-TMB), 1,2,4-trimethylbenzene (1,2,4-TMB), 1,2,3-trimethylbenzene (1,2,3-TMB), 1,2,4,5-tetramethylbenzene, 1,2,3,5-tetramethylbenzene, 1,2,3,4-tetramethylbenzene, naphthalene, 2-methylnaphthalene and 1-methylnaphthalene performed under Service Request #SF-1-118.

The analytical method was a modification of RSKSOP-124. Cool (38°C) on-column injection (0.5 µl) was used with electronic pressure control set for a constant flow of 0.9 ml/min. A 30M X 0.25 mm Restek Stabilwax (Crossbonded Carbowax-PEG, 0.5 µm film) capillary GC column with 9 inch long X 0.53 mm ID uncoated capillary precolumn was used. Quantitation was based on calibration curves of selected target ions (2 or 3 ions, total area) for each compound. A high level (5-250 µg/ml, naphthalenes 0.1-50 µg/ml) and low level (0.05-5 µg/ml) calibration curve was applied to each sample for quantitation. Complete reports detailing the acquisition method and calibration curves have been recorded. The soil samples were extracted by Mark Blankenship on March 6, 1995 and the free-floating product was received March 2, 1995. All samples were analyzed by GC/MSD on March 15-16, 1995.

If I can be of further assistance, please feel free to contact me.

Sincerely,


David A. Kovacs

xc: R.L. Cosby
J.L. Seeley
G.B. Smith

ManiTech Environmental Research Services Corporation

R.S. Kerr Environmental Research Laboratory, P.O. Box 1198, 919 Kerr Research Drive
Ada, Oklahoma 74821-1198 405-436-8660 FAX 405-436-8501

Sample	Benzene	TCE	PCE	Toluene	Ethylbenzene	p-Xylene	m-Xylene
QC (5 ug/ml)	4.81E+00	4.60E+00	4.71E+00	4.76E+00	4.79E+00	4.87E+00	4.77E+00
5.0 ug/ml	5.17E+00	4.81E+00	4.87E+00	5.06E+00	5.04E+00	5.14E+00	5.18E+00
MW-5 Free Product (ug/ml)	ND	ND	ND	9.51E+00	2.59E+02	2.80E+02	7.63E+01
50 chk	5.36E+01	4.98E+01	4.97E+01	5.27E+01	5.30E+01	5.20E+01	5.08E+01
0.1 ug/ml Naphthalenes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Method Blank SF-1-118	ND	ND	ND	ND	ND	ND	ND
SS-1	ND	BLQ	BLQ	BLQ	ND	ND	BLQ
SS-2	2.06E-01	ND	ND	BLQ	4.48E-01	3.14E-01	7.00E-01
SS-3	ND	ND	ND	BLQ	BLQ	1.86E-02	3.08E-02
10 ug/ml Naphthalenes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
250 ug/ml	2.46E+02	2.39E+02	2.38E+02	2.57E+02	2.62E+02	2.62E+02	2.63E+02
0.5 ug/ml	5.08E-01	5.17E-01	5.14E-01	5.17E-01	5.10E-01	4.97E-01	5.30E-01

BLQ <0.05 ug/ml except Naphthalenes <0.1 ug/ml

Sample	o-Xylene	1,3,5-TMB	1,2,4-TMB	1,2,3-TMB	1,2,4,5-MeBenzene	1,2,3,5-MeBenzene
QC (5 ug/ml)	4.81E+00	4.70E+00	4.64E+00	4.61E+00	N/A	N/A
5.0 ug/ml	5.08E+00	4.98E+00	5.00E+00	4.92E+00	4.71E+00	5.10E+00
MW-5 Free Product (ug/ml)	5.32E+01	4.20E+02	7.68E+02	3.02E+02	1.98E+02	4.45E+02
50 chk	5.31E+01	5.30E+01	5.33E+01	5.25E+01	5.08E+01	5.17E+01
0.1 ug/ml Naphthalenes	N/A	N/A	N/A	N/A	N/A	N/A
Method Blank SF-1-118	ND	ND	ND	ND	ND	ND
SS-1	ND	ND	ND	ND	ND	ND
SS-2	6.56E-02	1.21E-01	4.87E-01	1.35E-01	3.90E-02	6.93E-02
SS-3	2.10E-02	BLQ	2.48E-02	ND	BLQ	BLQ
10 ug/ml Naphthalenes	N/A	N/A	N/A	N/A	N/A	N/A
250 ug/ml	2.62E+02	2.71E+02	2.76E+02	2.70E+02	2.76E+02	2.72E+02
0.5 ug/ml	5.20E-01	5.12E-01	5.21E-01	5.20E-01	4.97E-01	5.01E-01

BLQ <0.05 ug/ml except Naphthalenes <0.1 ug/ml

Sample	1,2,3,4-MeBenzene	Naphthalene	2-MeNaphthalene	1-MeNaphthalene
QC (5 ug/ml)	N/A	N/A	N/A	N/A
5.0 ug/ml	5.12E+00	N/A	N/A	N/A
MW-5 Free Product (ug/ml)	1.03E+03	3.45E+01	4.93E+00	3.21E+00
50 chk	5.44E+01	N/A	N/A	N/A
0.1 ug/ml Naphthalenes	N/A	1.00E-01	1.00E-01	9.93E-02
Method Blank SF-1-118	ND	ND	ND	ND
SS-1	BLQ	ND	ND	ND
SS-2	3.13E-02	8.35E-02	2.37E-02	2.33E-02
SS-3	BLQ	ND	ND	ND
10 ug/ml Naphthalenes	N/A	9.79E+00	9.81E+00	9.84E+00
250 ug/ml	2.72E+02	N/A	N/A	N/A
0.5 ug/ml	5.05E-01	N/A	N/A	N/A

BLQ <0.05 ug/ml except Naphthalenes <0.1 ug/ml

SOILS RICKENBACHER AFB FOR TOC (SR# SF-1-118)

SAMPLES	SOIL FILTRATES %OC	SOLIDS %OC	TOTAL SOIL %TOC	MEAN %TOC
SS-1-1	0.010	1.505	1.515	1.514
SS-1-2	0.015	1.497	1.512	
SS-2-1	0.058	0.798	0.856	0.799
SS-2-2	0.065	0.677	0.742	
SS-3-1	0.004	1.458	1.462	1.409
SS-3-2	0.004	1.352	1.356	
LECO		1.020		
WPO33-I	7.7 MG/L			
	7.9 MG/L			

TRUE VALUES: LECO = 1.00 +/- 0.04% C
WPO33-I = 7.70 MG/L OC

TPH, mg oil/kg

< 50
< 50
< 50

Don Kampbell

% moisture

13.7
17.2
13.3

per Don Kampbell
phone conversation
4/12/95

Core Samples

	Moisture, %	TPH mg oil/kg	TOC, %
SS-1	13.7	< 50	1.5
SS-2	17.2	< 50	0.8
SS-3	13.3	< 50	1.4

MW-5
Product
mg/ml

Benzene	< 5
Toluene	10
Ethyl benzene	240
p-xylene	250
m-xylene	76
o-xylene	51
1,3,5 TriMB	388
1,2,4 TriMB	740
1,2,3 TriMB	540
1,2,3,5 Tetra MB	440
1,2,3,4 Tetra MB	860
TCE	< 5
PCE	< 5

377

SS-1	SS-2	SS-3
mg/kg	mg/kg	mg/kg
< 5	< 5	< 5
	7	5
	282	5
	198	11
	443	19
	41	12
	76	5
	309	16
	85	< 5
	25	< 5
	44	< 5
	< 5	< 5
	< 5	< 5

BTEX > TPH

Extractions

Fm Campbell

4/14/95

wpdocs
fdrickan.

File: Rickenbacker ANG
722450.25

Field Data Rickenbacker ANG, Ohio					
Sample	Date	Carbon Dioxide mg/l	Total Alkalinity mg/l	Ferrous Iron mg/l	Hydrogen Sulfide mg/l
ES mp-5S	2-27-95	150	293	<.05	-
ES mp-5D	2-27-95	228	370	1.9	<.1
ES mp-10D	2-27-95	296	426	1.8	<.1
ES mp-10S	2-27-95	192	314	.3	-
ES mp-8D	2-27-95	100	380	3.1	<.1
ES mp-11D	2-27-95	220	376	2.5	<.1
ES mp-7S	2-28-95	124	296	.1	
ES mp-7D	2-28-95	208	212	1.6	<.1
ES mp-6D	2-28-95	168	385	.9	<.1
ES mp-9D	2-28-95	150	393	.8	<.1
ES mp-9S	2-28-95	188	254	.1	-
MW-12	2-28-95	300	347	.3	-
ES mp-3D	2-28-95	216	389	1.0	-
MW-6	2-28-95	226	387	<.05	
MW - 11	2-28-95	94	211	<.05	-
ES mp-4D	2-28-95	220	394	.1	-
ES mp-4S	2-28-95	186	378	.8	-
ES mp-14S	2-28-95	288	440	3.2	<.1
ES mp-14D	2-28-95	214	393	1.4	<.1
ES mp-2D	2-28-95	190	344	1.3	-
ES mp-1D	2-28-95	170	336	.1	-
MW-3	2-28-95	276	368	<.05	-
MW-8	2-28-95	208	391	<.05	-
ES mp-13S	2-28-95	330	386	3.2	.1

<u>Sample</u>	<u>mg/L</u> <u>Cl⁻</u>	<u>mg/L</u> <u>SO₄⁼</u>	<u>mg/L</u> <u>NO₂⁻ + NO₃⁻(N)</u>	<u>mg/L</u> <u>NH₃</u>
ESMP-1D	10.2	41.4	<.05	0.22
ESMP-2D	13.1	56.7	0.09	0.10
ESMP-4D	7.31	87.1	0.08	0.06
ESMP-4S	5.10	144	0.08	0.10
ESMP-13D	17.0	54.9	0.09	0.07
ESMP-13D Field Dup	17.8	57.9	0.09	0.07
ESMP-13S	23.5	38.3	0.09	0.43
ESMP-13S Dup	23.3	38.2	----	----
ESMP-14D	17.0	58.7	0.11	0.09
ESMP-14D Dup	----	----	0.11	0.08
ESMP-14D Field Dup	16.3	57.1	0.11	0.08
ESMP-14S	7.29	19.2	0.09	0.13
ESMP-14S Field Dup	- NO SAMPLE -		0.09	0.12
ESMP-15D	20.1	264	0.41	0.10
ESMP-15S	16.1	206	0.32	0.19
ESMP-15S Dup	15.6	206	----	----
ESMP-16D	19.5	938	<.05	0.75
ESMP-16D Field Dup	20.7	895	<.05	0.74
ESMP-16S	53.3	208	<.05	1.22
ESMP-17S	7.26	41.0	0.09	0.29
MW-2	7.79	61.2	0.09	0.05
MW-3	21.1	127	0.10	0.06
MW-4	19.0	103	0.15	0.09
MW-4 Dup	----	----	0.15	0.09
MW-5	8.00	6.57	0.08	0.45
MW-8	8.00	20.0	0.06	0.10
MW-9	18.9	496	0.08	0.27
MW-9 Dup	20.0	498	----	----
MW-10	23.4	296	0.07	0.49
Blank	<.5	<.5	<.05	<.05
WP032	106	75.1	2.51	2.08
WP032 T.V.	106	75.0	2.81	2.30
Spike Rec.	101%	95%	98%	100%

<u>Sample</u>	<u>pH</u>	<u>Conductivity</u>	<u>Redox</u>
ESMP-5S	7.30	730	200
ESMP-5D	7.07	751	-45.8
ESMP-10D	7.01	823	-30.0
ESMP-10S	7.22	667	152
ESMP-8D	7.10	779	-93.8
ESMP-8D Dup	7.08	781	-89.5
ESMP-11D	7.09	786	-70.1
ESMP-7S	7.33	632	199
ESMP-7D	7.29	703	-53.5
ESMP-6D	7.18	840	-24.4
ESMP-9D	7.11	803	2.70
ESMP-9D Dup	7.10	817	-----
ESMP-9S	7.13	799	115
MW-12	7.04	854	38.6
ESMP-3D	7.06	810	-16.7
MW-6	6.96	1017	181
MW-6 Dup	6.98	1057	178
MW-11	7.38	566	194
ESMP-4D	7.02	874	140
ESMP-4S	6.98	965	23.1
ESMP-14D	7.09	767	-116
ESMP-14S	7.28	760	-115
ESMP-2D	7.16	761	-63.3
ESMP-1D	7.22	703	190
MW-3	7.08	943	212
MW-3 Dup	7.10	961	213
MW-8	7.34	719	209
ESMP-13D	7.14	775	-136
ESMP-13S	7.21	841	-136
ESMP-17S	7.24	773	-125
ESMP-15S	7.55	731	-95.0
ESMP-15D	8.22	764	72.1
MW-2	7.16	832	212
MW-10	7.11	1172	-92.1
MW-5	7.07	942	-115
ESMP-16S	7.00	2150	-143
ESMP-16D	6.94	2070	-170
ESMP-16D Field D.	6.95	2080	-172
MW-9	6.82	1596	19.1
MW-4	6.95	859	210

GROUNDWATER SAMPLES FROM RICKENBACHER AFB FOR TOC & TIC (SR# SF-1-118)

SAMPLES	MG/L TC	MG/L OC	MG/L TIC	SAMPLES	MG/L TC	MG/L OC	MG/L TIC
MW-2	112.0	5.3	106.7	ESMP-15D	132.8	114.2	18.6
MW-03	105.6	4.6	101.0	ESMP-15D DUP	132.8	115.0	17.8
MW-4	112.4	7.2	105.2	ESMP-15S	134.0	97.0	37.0
MW-5	197.2	139.6	57.6	ESMP-16D	156.4	61.3	95.1
MW-6	-----	5.5	-----	ESMP-16S	594.0	523.0	71.0
MW-6 DUP	-----	5.6	-----	ESMP-17S	104.0	2.0	102.0
MW-9	150.0	7.6	142.4				
MW-9 DUP	149.6	7.6	142.0	WPO32-II	10.2 MG/L		
MW-8	105.2	13.4	91.8		10.3 MG/L		
MW-10	100.4	5.7	94.7		10.9 MG/L		
MW-11	56.0	1.0	55.0		9.5 MG/L		
MW-12	98.8	3.5	95.3		9.8 MG/L		
MW-12 DUP	98.8	3.6	95.2				
ESMP-1D	92.0	3.3	88.7	WPO33-I	7.7 MG/L		
ESMP-1D DUP	92.0	3.3	88.7		7.9 MG/L		
ESMP-2D	94.8	2.6	92.2				
ESMP-3D	108.4	1.6	106.8				
ESMP-4D	109.6	2.6	107.0				
ESMP-4S	109.2	2.7	106.5				
ESMP-5D	98.0	2.0	96.0				
ESMP-5D DUP	98.4	2.0	96.4				
ESMP-5S	82.0	1.7	80.3				
ESMP-6D	112.0	4.1	107.9				
ESMP-7D	83.6	5.0	78.6				
ESMP-7S	83.2	4.4	78.8				
ESMP-8DD	99.2	1.3	97.9				
ESMP-8DD DUP	99.6	1.3	98.3				
ESMP-8S	-----	5.1	-----				
ESMP-8S DUP	-----	5.3	-----				
ESMP-9D	108.0	1.6	106.4				
ESMP-9S REP 1	95.6	7.2	88.4				
ESMP-9S REP 2	95.6	4.8	90.8				
ESMP-10D	122.4	3.9	118.5				
ESMP-10S	83.2	2.9	80.3				
ESMP-11D	100.4	2.6	97.8				
ESMP-11D DUP	100.8	2.6	98.2				
ESMP-13D	97.2	2.1	95.1				
ESMP-13D DUP	97.2	2.1	95.1				
ESMP-13S	129.6	27.6	102.0				
ESMP-14D	96.0	3.2	92.8				
ESMP-14D REP 3	96.0	3.6	92.4				
ESMP-14S REP 1	107.6	3.1	104.5				
ESMP-14S REP 1 DUP	107.6	3.1	104.5				
ESMP-14S REP 3	107.6	3.7	103.9				

TRUE VALUE: WPO32-II = 9.9 MG/L
WPO33-I = 7.7 MG/L

SampleName	BENZENE	TOLUENE	ETHYL BENZENE	P-XYLENE	m-XYLENE	o-XYLENE	1,3,5-TMB	1,2,4-TMB	1,2,3-TMB	1,2,4,5-TETRA	1,2,3,5-TETRA	1,2,3,4,5-TETRA
100 PPB	101.52	101.31	101.85	101.75	101.59	101.49	104.75	101.72	101.49	103.59	103.75	103.53
QC, OBSERVED, PPB	53.37	52.37	49.45	51.27	51.40	51.84	51.07	51.17	52.80	46.48	51.01	48.49
QC, TRUE VALUE, PPB	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
MW-2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	ND	ND	0.97
MW-3	BLQ	BLQ	BLQ	BLQ	BLQ	ND	BLQ	ND	ND	ND	ND	ND
MW-4	BLQ	BLQ	BLQ	BLQ	BLQ	ND	BLQ	ND	ND	ND	ND	ND
MW-5	17.19	41.94	317.97	229.22	91.23	55.48	59.44	208.63	77.96	15.01	36.23	71.99
MW-6	1.67	BLQ	BLQ	BLQ	BLQ	ND	ND	ND	ND	ND	ND	ND
MW-8	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10 PPB	9.91	9.80	9.80	9.74	9.86	10.03	9.69	9.56	9.80	9.29	9.34	9.11
MW-12	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-1D	ND	BLQ	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-1S	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-2D	ND	1.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-3D	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-3D Duplicate	ND	BLQ	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-4D	ND	2.48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-4S	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-5D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-5S	ND	BLQ	BLQ	BLQ	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-6D	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
500 PPB	498.59	496.60	498.93	497.67	498.24	499.48	495.16	495.94	497.71	484.56	489.47	485.47
ESMP-6S	ND	3.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-7D	BLQ	BLQ	BLQ	BLQ	ND	ND	BLQ	ND	ND	BLQ	BLQ	0.95
ESMP-7S	BLQ	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-8S	ND	1.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.60
ESMP-8DD	ND	BLQ	ND	ND	BLQ	ND	ND	ND	ND	ND	ND	ND
ESMP-9DD Duplicate	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-9D	ND	BLQ	ND	ND	BLQ	ND	ND	ND	ND	ND	ND	ND
ESMP-9S	ND	BLQ	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-10D	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-10S	ND	BLQ	ND	ND	BLQ	ND	ND	ND	ND	ND	ND	ND
GC LAB BLANK, PPB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
QC, OBSERVED, PPB	55.36	54.07	50.85	52.91	53.28	53.92	52.39	51.88	52.98	45.16	50.36	48.87
QC, TRUE VALUE, PPB	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
ESMP-11D	BLQ	BLQ	BLQ	BLQ	ND	ND	ND	ND	ND	BLQ	BLQ	0.98
ESMP-12S	ND	2.44	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-12S Duplicate	ND	2.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-13D	ND	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-13S	424.18	22.41	237.09	106.99	163.61	8.98	14.28	62.49	39.14	4.61	8.85	15.71
ESMP-14D	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-14DD	ND	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-14S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ESMP-15D	ND	BLQ	ND	ND	BLQ	ND	ND	ND	ND	ND	ND	ND
ESMP-15S	BLQ	1.08	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	1.41	12.88
100 PPB	102.11	101.76	102.08	100.97	103.04	101.77	104.58	101.52	101.47	102.62	103.02	103.29
ESMP-16D	6.46	BLQ	26.87	22.60	7.80	31.63	5.71	31.88	17.08	4.84	6.84	5.94
ESMP-16S	89.18	BLQ	228.50	44.20	18.02	91.43	8.42	62.76	57.44	22.71	32.54	34.07
ESMP-17S	BLQ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10 PPB	10.01	10.08	10.09	9.89	9.95	10.05	9.94	9.67	9.75	9.41	9.45	9.16

Table 1. Quantitation Report for S.R. # SF-1-118 from Rickenbacker.

Concentration = ppb

Compound	MW-2	MW-03	MW-4	MW-5	MW-6	MW-6 Field Dup 1/4 Dil	MW-8	MW-9	MW-10	MW-11	MW-11 Lab Dup
VINYL CHLORIDE	ND	ND	ND	ND	23.1	21.9	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	6.5	6.5	ND	ND	ND	ND	ND
T-1,2-DICHLOROETHENE	ND	ND	ND	ND	47.3	43.2	ND	ND	ND	ND	ND
C-1,2-DICHLOROETHENE	ND	---	ND	ND	873	794	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	2.3	2.2	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	12.4	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	*****	9580	---	ND	ND	ND	---
TRICHLOROETHENE	ND	1.0	ND	32.7	---	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	306	ND	ND	ND	ND	ND	ND	ND
m+p-XYLENE	ND	ND	ND	312	ND	ND	ND	ND	ND	ND	ND
o-XYLENE	ND	ND	ND	52.6	ND	ND	ND	ND	ND	ND	ND

Compound	MW-12	MW-12 Field Dup	ESMP 1D	ESMP 1S	ESMP 2D	ESMP 2S	ESMP 03	ESMP 3D	ESMP 4D	ESMP 4S	ESMP 5D
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	16.0	1.0	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
T-1,2-DICHLOROETHENE	ND	ND	ND	ND	1.0	ND	ND	ND	ND	ND	ND
C-1,2-DICHLOROETHENE	ND	ND	ND	ND	---	ND	---	1.3	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	---	ND	ND	95.6	ND	1.0	6.5	ND	ND	ND
TOLUENE	ND	ND	---	---	1.0	3.6	ND	---	1.5	---	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m+p-XYLENE	ND	ND	ND	ND	ND	---	ND	ND	ND	ND	ND
o-XYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = None Detected --- = Below Calibration Limit (1.0 ppb) Dil = Dilution Dup = Duplicate ***** = Above Calibration Limit (5000 ppb)

Table 2. Quantitation Report for S.R. # SF-1-118 from Rickenbacker.

Concentration = ppb

Compound	ESMP 5S	ESMP 6D	ESMP 6D Lab Dup	ESMP 7D	ESMP 7S	ESMP 8DD	ESMP 8S	ESMP 9D	ESMP 9S	ESMP 10D	ESMP 10S
VINYL CHLORIDE	ND	1.7	2.0	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
T-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m+p-XYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-XYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Compound	ESMP 10S Lab Dup	ESMP 11D	ESMP 12S	ESMP 13D	ESMP 13D Field Dup	ESMP 13S	ESMP 14D	ESMP 14D Field Dup	ESMP 14DD	ESMP 14S Lab Dup
VINYL CHLORIDE	ND	ND	ND	ND	ND	2.7	1.0	1.0	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND
T-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	300	ND	ND	ND	ND
C-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	228	2.2	2.1	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	---	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	423	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	220	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	1.0	ND	---	ND	ND	45.6	ND	ND	ND	ND
TOLUENE	---	ND	1.7	ND	ND	19.7	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	209	ND	ND	ND	ND
m+p-XYLENE	ND	ND	ND	ND	ND	248	ND	ND	ND	ND
o-XYLENE	ND	ND	ND	ND	ND	7.7	ND	ND	ND	ND

ND = None Detected --- Below Calibration Limit(1.0 ppb) Dup = Duplicate

Table 3. Quantitation Report for S.R. # SF-1-118 from Rickenbacker.

Concentration = ppb

Compound	ESMP 15D	ESMP 15S	ESMP 16D	ESMP 16S	ESMP 17S	QC0307A 20 ppb	QC0307B 200 ppb	QC0307C 20 ppb	QC0307D 200 ppb	QC0307E 20 ppb	QC0307F 200 ppb
VINYL CHLORIDE	ND	ND	ND	ND	1570	22.3	222	20.3	Cracked	21.3	207
1,1-DICHLOROETHENE	ND	ND	ND	ND	11.7	23.0	226	20.4	Vial	20.8	203
T-1,2-DICHLOROETHENE	ND	ND	ND	ND	152	20.2	202	19.4	sample	20.1	191
C-1,2-DICHLOROETHENE	ND	ND	--	--	4913	19.0	201	20.5	lost	19.9	195
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	22.0	219	19.7		20.0	200
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	22.7	222	19.6		20.6	198
BENZENE	ND	ND	6.2	82.7	ND	21.8	228	22.0		22.2	219
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	19.6	216	22.6		23.8	224
TRICHLOROETHENE	ND	ND	ND	ND	--	22.8	229	21.4		22.1	210
TOLUENE	ND	--	--	--	ND	20.9	210	21.1		20.6	197
TETRACHLOROETHENE	ND	ND	ND	ND	ND	22.9	221	19.6		19.8	197
CHLOROBENZENE	ND	ND	ND	ND	ND	21.2	214	22.6		21.7	212
ETHYLBENZENE	ND	ND	23.6	186	ND	21.4	211	18.9		20.3	194
m+p-XYLENE	ND	ND	26.0	48.2	ND	42.8 *	420 **	39.6 *		40.9 *	383 **
o-XYLENE	ND	ND	27.9	77.3	ND	20.3	208	20.3		20.8	202
	QC0307G 20 ppb	QC0307H 200 ppb	QC0307I 20 ppb	QC0307J 200 ppb	QC0310A 20 ppb	QC0310B 200 ppb	BL0307A	BL0307B			
VINYL CHLORIDE	20.8	201	21.9	196	22.0	200	--	--			
1,1-DICHLOROETHENE	20.0	208	19.9	203	21.8	207	--	--			
T-1,2-DICHLOROETHENE	19.4	192	19.3	202	19.9	189	--	--			
C-1,2-DICHLOROETHENE	19.3	198	19.9	207	19.7	195	--	--			
1,1,1-TRICHLOROETHANE	20.0	203	20.3	199	21.4	208	--	--			
CARBON TETRACHLORIDE	20.0	205	20.5	203	21.1	209	--	--			
BENZENE	20.9	225	22.2	224	22.6	218	--	--			
1,2-DICHLOROETHANE	20.9	228	22.5	230	21.9	226	--	--			
TRICHLOROETHENE	20.4	215	21.3	209	22.5	216	--	--			
TOLUENE	20.7	202	20.6	199	20.7	203	--	--			
TETRACHLOROETHENE	19.7	202	20.1	198	20.4	191	--	--			
CHLOROBENZENE	20.9	213	21.7	215	22.0	212	--	--			
ETHYLBENZENE	19.6	205	19.7	196	20.0	201	--	--			
m+p-XYLENE	39.8 *	391 **	40.3 *	388 **	39.8 *	384 **	--	--			
o-XYLENE	20.1	209	19.6	208	20.8	205	--	--			

ND = None Detected * = 40 ppb Std. ** = 400 ppb Std. QC = Quality Control Std. BL = Blank --- = Below Calibration Limit(1.0 ppb)

ANALYZED 3/7/95

SAMPLE	METHANE	ETHYLENE
LAB BLANK	ND	ND
ESMP-3D	0.067	ND
ESMP-5D	0.106	ND
ESMP-5S	0.002	ND
ESMP-6D	0.079	ND
ESMP-7D	0.478	ND
ESMP-7S	0.017	ND
ESMP-8DD	0.006	ND
ESMP-8S	0.003	ND
ESMP-9D	0.008	ND
ESMP-9S	0.015	ND
" FIELD DUP	0.016	ND

units = mg/LLower quantitation limits:

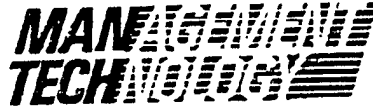
methane = 0.001 mg/L

ethylene = 0.003 mg/L

per Do- Campbell phone conv.
4/12/95

ANALYZED 3/8/95

SAMPLE	METHANE	ETHYLENE
LAB BLANK	BLQ	ND
ESMP-10D	0.012	ND
ESMP-10S	0.003	ND
ESMP-11D	0.105	ND
MW6	0.013	ND
MW11	BLQ	ND
MW12	0.001	ND
ESMP-1D	0.058	ND
ESMP-2D	0.067	ND
ESMP-4D	0.015	0.001 = <0.003
ESMP-4S	0.109	ND
ESMP-13D	0.110	ND
" FIELD DUP	0.114	ND
ESMP-13S	7.830	0.001 = <0.003
ESMP-14D	0.106	ND
ESMP-14S	0.462	ND
ESMP-15D	0.007	ND
ESMP-15S	0.136	ND
" LAB DUP	0.129	ND
ESMP-16D	1.150	ND
" FIELD DUP	1.182	ND
ESMP-16S	3.067	ND
ESMP-17S	2.296	0.057
MW2	0.661	ND
MW3	0.003	ND
MW4	0.002	ND
MW5	7.693	ND
" LAB DUP	7.178	ND
MW8	0.015	ND
MW9	0.004	ND
MW10	0.040	ND



Ref: 95-DF20

April 17, 1995

Dr. Don Kampbell
R.S. Kerr Environmental Research Lab
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74820

THRU: S.A. Vandegrift

Dear Don:

As requested in Service Request SF-1-118, GC/MS analysis for phenols and aliphatic/aromatic acids was done on one water sample labelled MW-5 from Rickenbacken ANGB. Liquid-liquid extraction was done by Mark Blankenship on April 6, 1995. The extract was analyzed by GC/MS on April 13, 1995. A SOP describing the extraction, derivatization and GC/MS analysis is in preparation.

Liquid-Liquid Extraction of Phenols and Aliphatic/Aromatic Acids.

For the extraction of the phenols and aliphatic/aromatic acids from the water sample, 100 ml of the water sample is placed in a dried, silanized 125 ml separatory funnel. Spike solutions if applicable were added to the sample at this time. The pH of the water is adjusted to 2.0 using 1:1 H_2SO_4 . For a water blank without Na_3PO_4 added, a pH of 2 is reached with ten drops. For 100 ml of water sample preserved with Na_3PO_4 , twenty drops of acid is required. Next 25 g of NaCl is added to the separatory funnel after which the liquid is swirled to dissolve the salt.

The water sample is extracted four times with 5 ml aliquots of acid free methylene chloride. To remove acids from methylene chloride and other solvents, 10 g of Celite Micro-Cel T-49 is added to one liter of GC/MS grade solvent. This mixture is stirred for one hour, allowed to settle and is filtered through a Millipore organic filter pad using Millipore vacuum apparatus. The methylene chloride extracts are collected in silanized 40 ml VOA vials. The total extract volume is recorded.

ManTech Environmental Research Services Corporation

R.S. Kerr Environmental Research Laboratory, P.O. Box 1198, 919 Kerr Research Drive
Ada, Oklahoma 74821-1198 405-436-8660 FAX 405-436-8501

Phenol/Acid Derivatization to Form PFB Ethers and Esters.

A 200 μ l aliquot of the methylene chloride extract is delivered to a 2 ml screw cap vial containing 2.5 mg of dried potassium carbonate. Next 790 μ l of acid free acetonitrile, 10 μ l of 100 ppm benzoic acid-d₅ and 10 μ l of pentafluorobenzyl bromide is added to the vial. Benzoic acid-d₅ is the internal standard for the analysis. The vials are momentarily placed in a sonic bath to free the solid salt from the bottom of the vial. The screw caps of the vials are tightened and the vials are heated in an oven at 60°C for 2 hours. When the vials are removed from the oven, 500 μ l of 0.1M HCl is added. The vials are shaken for 30 seconds and 200 μ l of the top organic layer is delivered to the liner of a 2 ml crimp cap autosampler vial.

Negative Ion Chemical Ionization GC/MS Analysis of PFB-Derivatives.

For negative ion chemical ionization GC/MS, a chemical ionization ion volume is placed in the ion source block of the Finnigan 4615 GC/MS. Methane gas is regulated using a needle valve until the ionizer pressure reaches 0.40 torr. With the ionizer at this pressure, the high vacuum pressure indicates 1.0×10^{-5} torr. The mass spectrometer is tuned using the calibration gas, FC-43, to obtain good peak shape for ions 414 and 633 m/z and a relative intensity of 100:14:4 for ions 633, 414 and 127 m/z. The ion source is heated at 150°C. The injector and transfer lines are held at 275°C.

The Hewlett Packard 7673 autoinjector delivered 0.5 μ l of the sample or standard to the GC injection port. A splitless injection for 1 minute was used for the analysis. The analytical column was a 60 meter, 0.25 mm J&W DB5-MS capillary column with 0.25 μ m film thickness. The column was temperature programmed from 50°C to 100°C at 30°C/min and then to 300°C at 6°C/min. The helium linear velocity measured with air was 36 cm/s when the oven temperature was 100°C and the helium head pressure on the column was 29 psi. The Finnigan 4615 GC/MS was scanned from 42 to 550 m/z in 0.5 sec.

Standard curves are prepared using a mixture containing thirteen phenols, twenty-five aliphatic acids and nineteen aromatic acids. Calibration curves for acetic acid was not prepared due to artefact levels of this acid in solvents. Derivatization of the standard solutions and samples was done in the same manner. Standards are prepared at 5, 10, 25, 50, 100, 500 and 1000 ppb. Quality assurance was maintained during the sample analysis by running check standards, derivatization blanks, extraction blanks, extraction recovery check standards and spiked field samples.

Quantitative Results of Phenols and Aliphatic/Aromatic Acids.

Table I provides the concentrations of phenols and aliphatic/aromatic acids found in the water sample taken at the Rickenbacken ANGB site and quality assurance samples run at the same time as the samples. The lowest reported value of phenol or acid in this table is at or about 5 ppb.

Spike recoveries for each of the acids and phenols were determined in 50 ppb spikes of 100 ml of water blank. Recovery of the 50 ppb concentration was poor for low molecular weight aliphatic acids due to the poor extraction efficiencies of these acids from water. Higher molecular weight aliphatic acids and all the phenols and aromatic acids exhibit good recoveries.

Sample MW5 contained high levels of lower molecular weight acids and branched heptanoic and octanoic acids. The branched octanoic acids are present in the water sample at or above 1 ppm. These compounds are labelled in the attached chromatograms. One chromatogram shows the extracted ion profile of C_6 , C_7 , C_8 and C_9 branched chain acids. The extracted ion for each corresponds to the carboxylate ion of each acid. Also included please find extracted ion profiles for m/z ions 141 and 155. The 141 ion could correspond to octenoic acids, methylcyclohexanecarboxylic acids or dimethylcyclopentanecarboxylic acids. Compounds such as nonenoic acids or dimethyl-(or ethyl)cyclohexenecarboxylic acids could give carboxylic ions at 155 m/z.

Please note that a problem has occurred in the determination of benzoic acid. A larger amount of benzoic acid was found in the extraction blank than in the sample. We will determine the source of the benzoic acid artifact before the next acid/phenol sample queue is started.

If you should have any questions, please feel free to contact me.

Sincerely,

Dennis D. Fine
Dennis D. Fine

xc: J.L. Seeley *JS*
G.B. Smith
R.L. Cosby

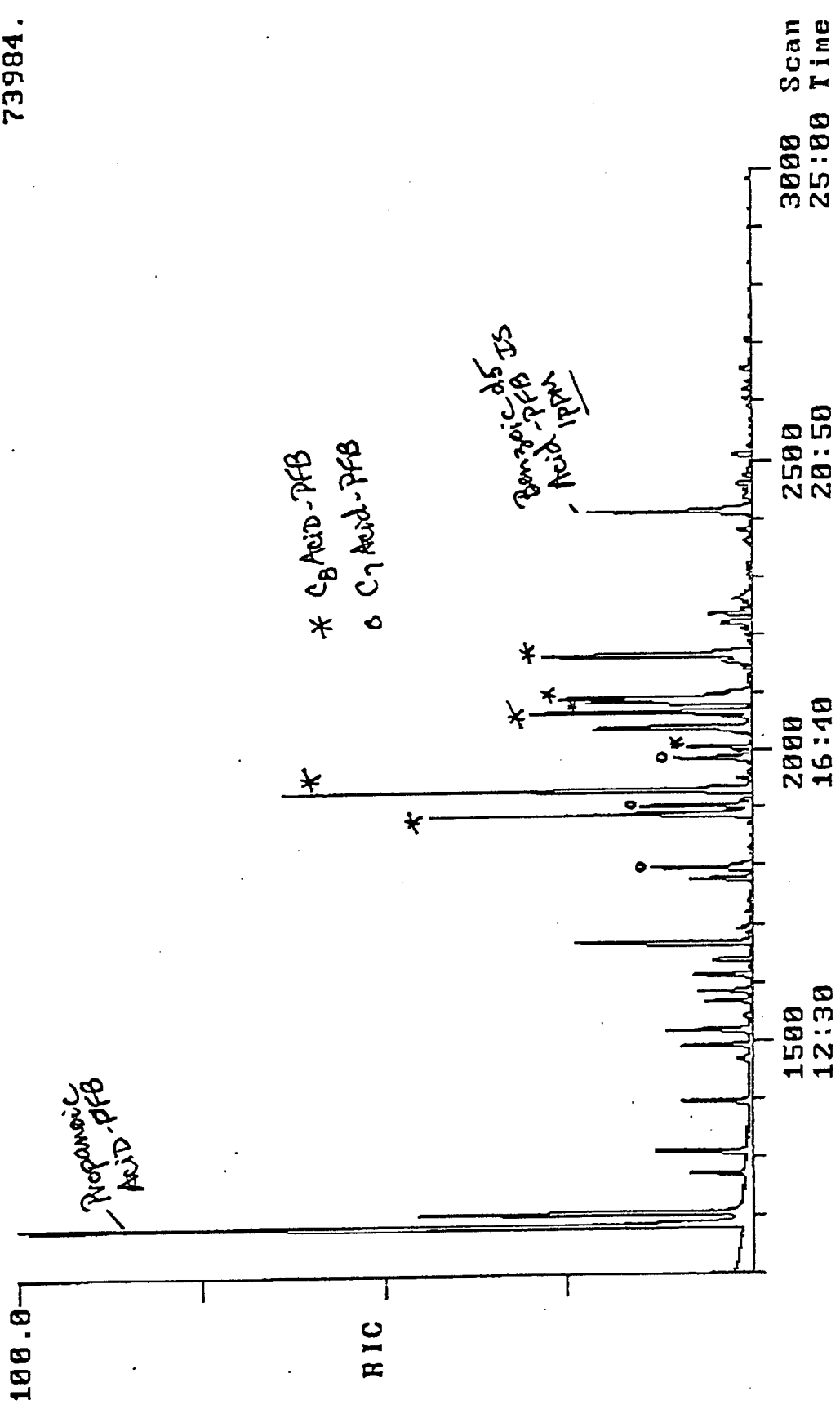
Table 1. Quantitative Report and QC Data for Phenols and Aliphatic and Aromatic Acids
for Samples from Rickenbacker ANG8 (Service Request SF-1-118).

	Extraction Blank	50 ppb Extraction Recovery	MW45
1 PROPANOIC ACID - PFB	22	44	1594
2 2-METHYLPROPANOIC ACID - PFB	5	14	76
3 TRIMETHYL ACETIC ACID - PFB	5	52	186
4 BUTYRIC ACID - PFB	11	11	121
5 2-METHYLBUTYRIC ACID - PFB	---	41	187
6 3-METHYLBUTYRIC ACID - PFB	---	38	267
7 3,3-DIMETHYLBUTYRIC ACID - PFB	N.F.	58	144
8 PENTANOIC ACID - PFB	7	41	110
9 2,3-DIMETHYLBUTYRIC ACID - PFB	N.F.	58	689
10 2-ETHYLBUTYRIC ACID - PFB	N.F.	57	20
11 2-METHYLPENTANOIC ACID - PFB	N.F.	59	44
12 3-METHYLPENTANOIC ACID - PFB	N.F.	58	248
13 4-METHYLPENTANOIC ACID - PFB	N.F.	87	70
14 HEXANOIC ACID - PFB	20	61	33
15 2-METHYLHEXANOIC ACID - PFB	N.F.	63	14
16 PHENOL - PFB	---	52	---
17 CYCLOPENTANECARBOXYLIC ACID - PFB	N.F.	45	25
18 5-METHYLHEXANOIC ACID - PFB	N.F.	61	8
19 o-CRESOL - PFB	N.F.	63	N.F.
20 2-ETHYLHEXANOIC ACID - PFB	---	64	1838
21 HEPTANOIC ACID - PFB	8	64	---
22 m-CRESOL - PFB	N.F.	61	N.F.
23 p-CRESOL - PFB	N.F.	60	---
24 1-CYCLOPENTENE-1-CARBOXYLIC ACID - PFB	N.F.	43	N.F.
25 o-ETHYLPHENOL - PFB	N.F.	63	N.F.
26 CYCLOPENTANEACETIC ACID - PFB	N.F.	59	20
27 2,6-DIMETHYLPHENOL - PFB	N.F.	50	N.F.
28 2,5-DIMETHYLPHENOL - PFB	N.F.	58	N.F.
29 CYCLOHEXANECARBOXYLIC ACID - PFB	N.F.	61	14
30 3-CYCLOHEXENE-1-CARBOXYLIC ACID - PFB	---	55	N.F.
31 2,4-DIMETHYLPHENOL - PFB	N.F.	48	N.F.
32 3,5-DIMETHYLPHENOL & 4-ETHYLPHENOL - PFB	N.F.	131	N.F.
33 OCTANOIC ACID - PFB	---	64	5
34 2,3-DIMETHYLPHENOL - PFB	N.F.	62	N.F.
35 p-ETHYLPHENOL - PFB	N.F.	67	N.F.
36 BENZOIC ACID - PFB	88	71	19
37 3,4-DIMETHYLPHENOL - PFB	N.F.	63	N.F.
38 m-METHYLBENZOIC ACID - PFB	N.F.	45	---
39 1-CYCLOHEXENE-1-CARBOXYLIC ACID - PFB	N.F.	58	N.F.
40 CYCLOHEXANEACETIC ACID - PFB	N.F.	67	168
41 2-PHENYLPROPANOIC ACID - PFB	N.F.	60	---
42 o-METHYLBENZOIC ACID - PFB	N.F.	59	---
43 PHENYLACETIC ACID - PFB	---	56	6
44 m-TOLYLACETIC ACID - PFB	N.F.	43	6
45 o-TOLYLACETIC ACID - PFB	N.F.	42	---
46 2,6-DIMETHYLBENZOIC ACID - PFB	N.F.	65	---
47 p-TOLYLACETIC ACID - PFB	N.F.	43	---
48 p-METHYLBENZOIC ACID - PFB	N.F.	58	7
49 3-PHENYLPROPANOIC ACID - PFB	N.F.	53	---
50 2,5-DIMETHYLBENZOIC ACID - PFB	N.F.	58	---
51 DECANOIC ACID - PFB	---	62	---
52 2,4-DIMETHYLBENZOIC ACID - PFB	N.F.	62	---
53 3,6-DIMETHYLBENZOIC ACID - PFB	N.F.	49	---
54 2,3-DIMETHYLBENZOIC ACID - PFB	N.F.	61	---
55 4-ETHYLBENZOIC ACID - PFB	N.F.	65	---
56 2,4,6-TRIMETHYLBENZOIC ACID - PFB	N.F.	69	8
57 3,4-DIMETHYLBENZOIC ACID - PFB	N.F.	60	7
58 2,4,5-TRIMETHYLBENZOIC ACID - PFB	N.F.	81	---

--- Indicates concentration of extract was below lowest calibration standard (5 ppt).

N.F. Indicates not found.

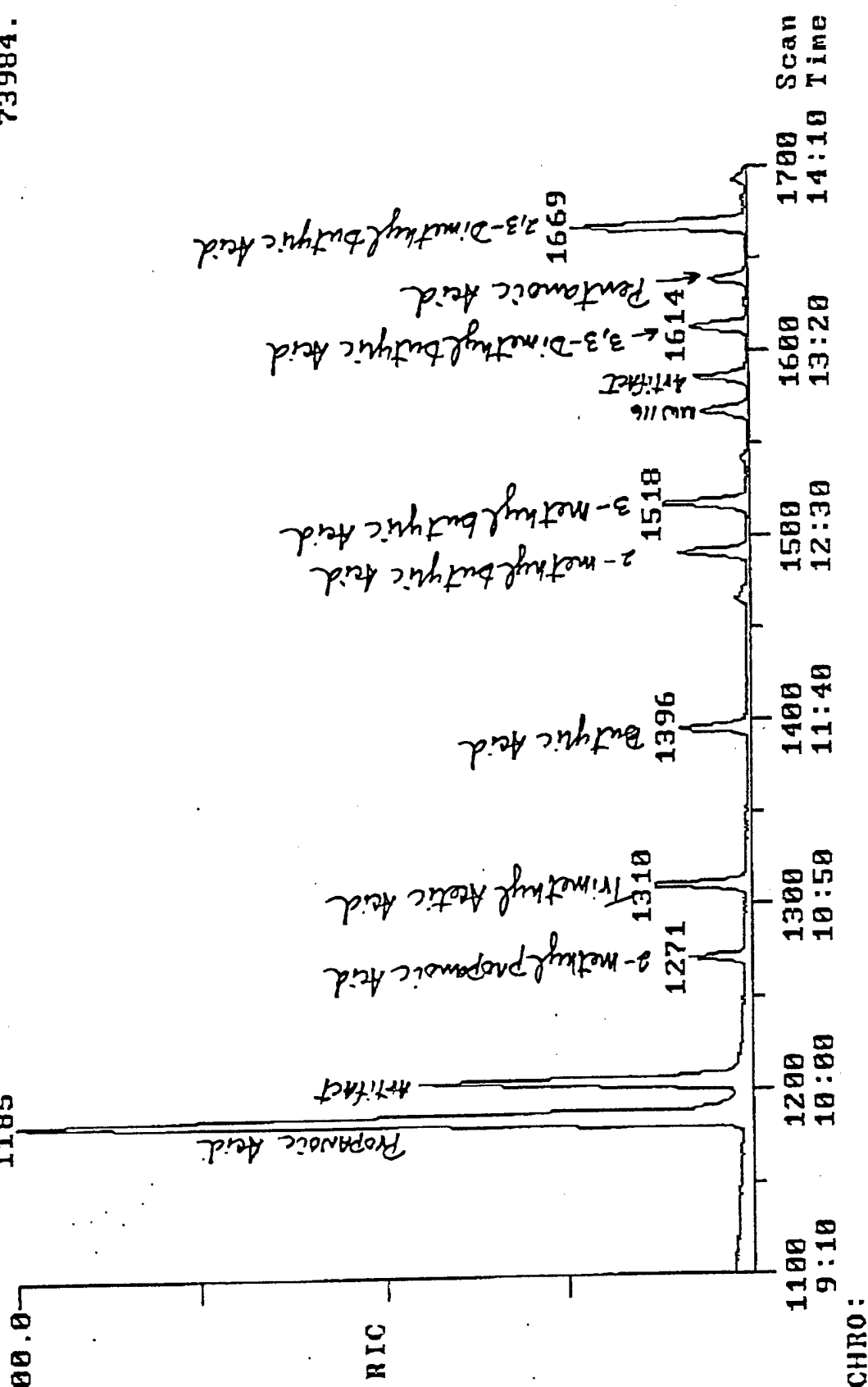
RIC
 04/13/95 17:42:00
 Sample: 50ML SAMPLE MW5
 Conds.: 50C(1M) TO 100C 30C/M TO 300C 6C/M SPLITLESS 1M DB5MS60.25.25
 Range: G 1,4000 Label: N 0, 4.0 Quan: A 0, 1.0 J 0 Base: U 20, 3
 100.0
 Scans 1100 to 3000
 Data: 694MW5 #1
 Cali: NICAL412 #3
 73984.



RIC
 04/13/95 17:42:00
 Sample: 50ML SAMPLE MW5
 Conds.: 50C(1M) TO 100C 30C/M TO 300C 6C/M SPLITLESS 1M DB5MS60.25.25
 Range: G 1,4000 Label: N 0, 4.0 Quan: A 0, 1.0 J 0 Base: U 20, 3
 1185
 73984.

Data: 694MW5 #1
 Cali: NICAL412 #3

Scans 1100 to 1700

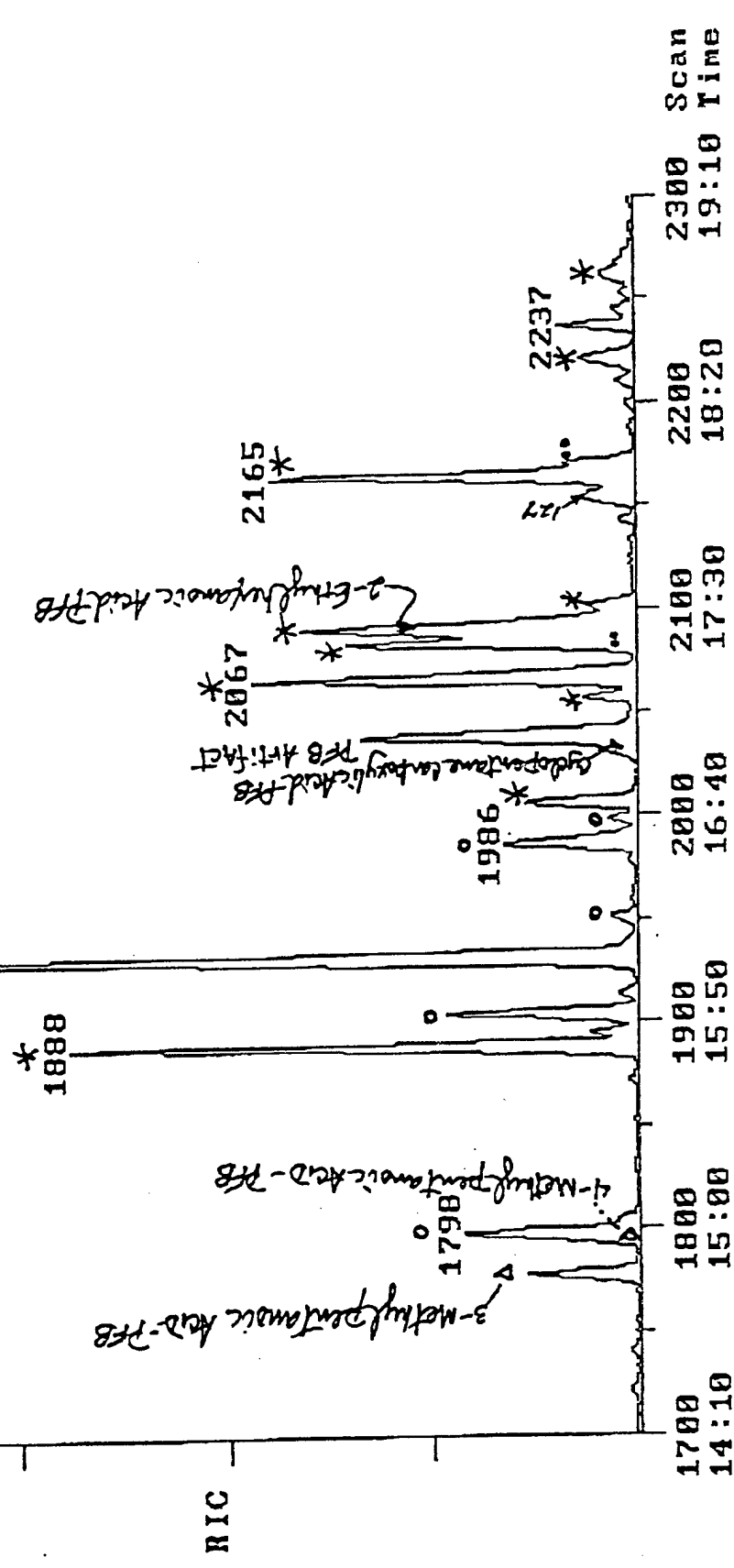


RIC
 04/13/95 17:42:00
 Sample: 50ML SAMPLE MW5
 Conds.: 50C(1M) TO 100C 30C/M TO 300C 6C/M SPLITLESS 1M DB5MS60.25.25
 Range: G 1,4000 Label: N 0, 4.0 Quan: A 0, 1.0 J 0 Base: U 20, 3
 1931
 100.0

Data: 694MW5 #2039
 Cali: NICAL412 #3

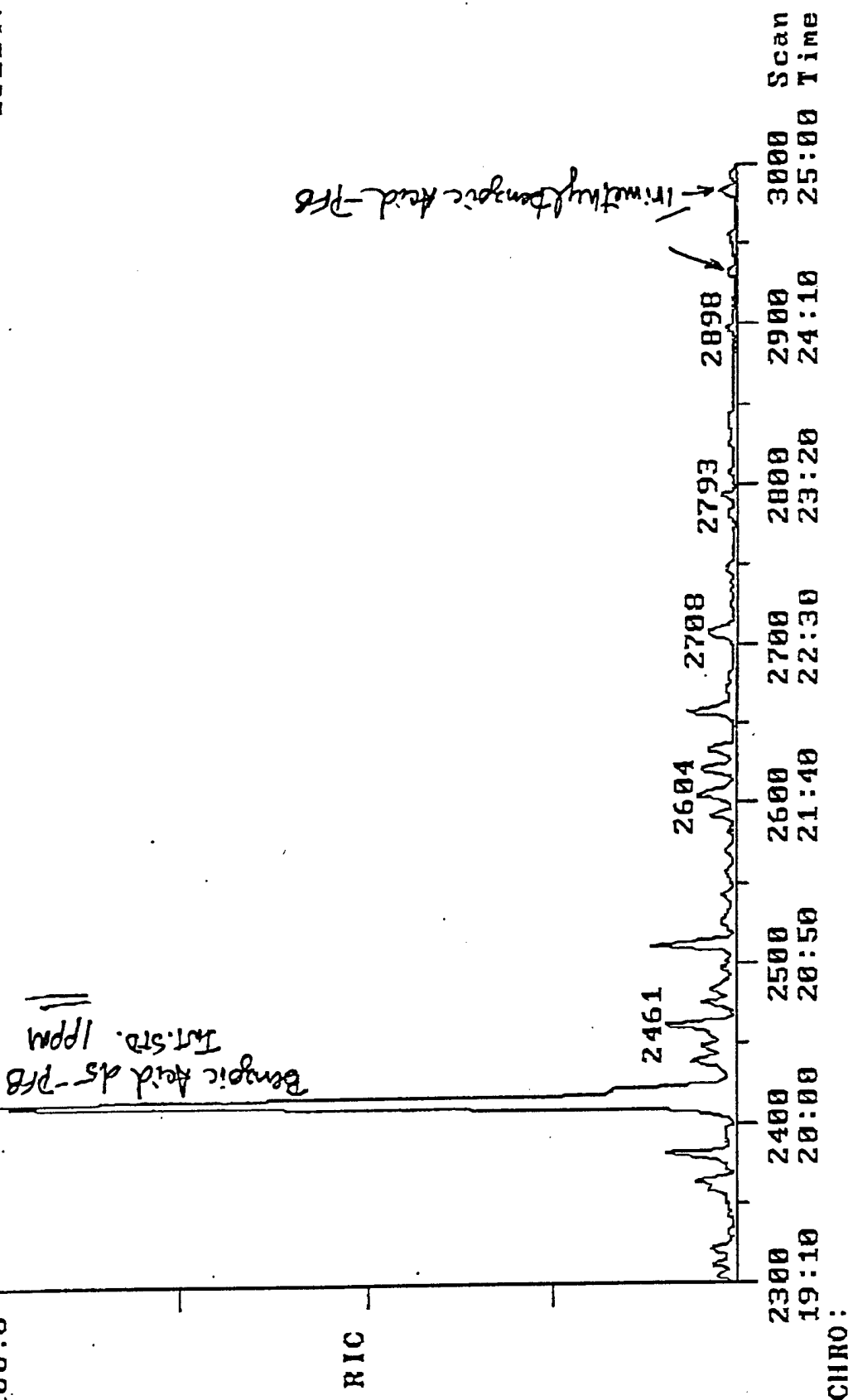
Scans 1700 to 2300

- .. C9 Acid-PFB
- * C8 Acid-PFB
- o C7 Acid-PFB
- Δ C6 Acid-PFB

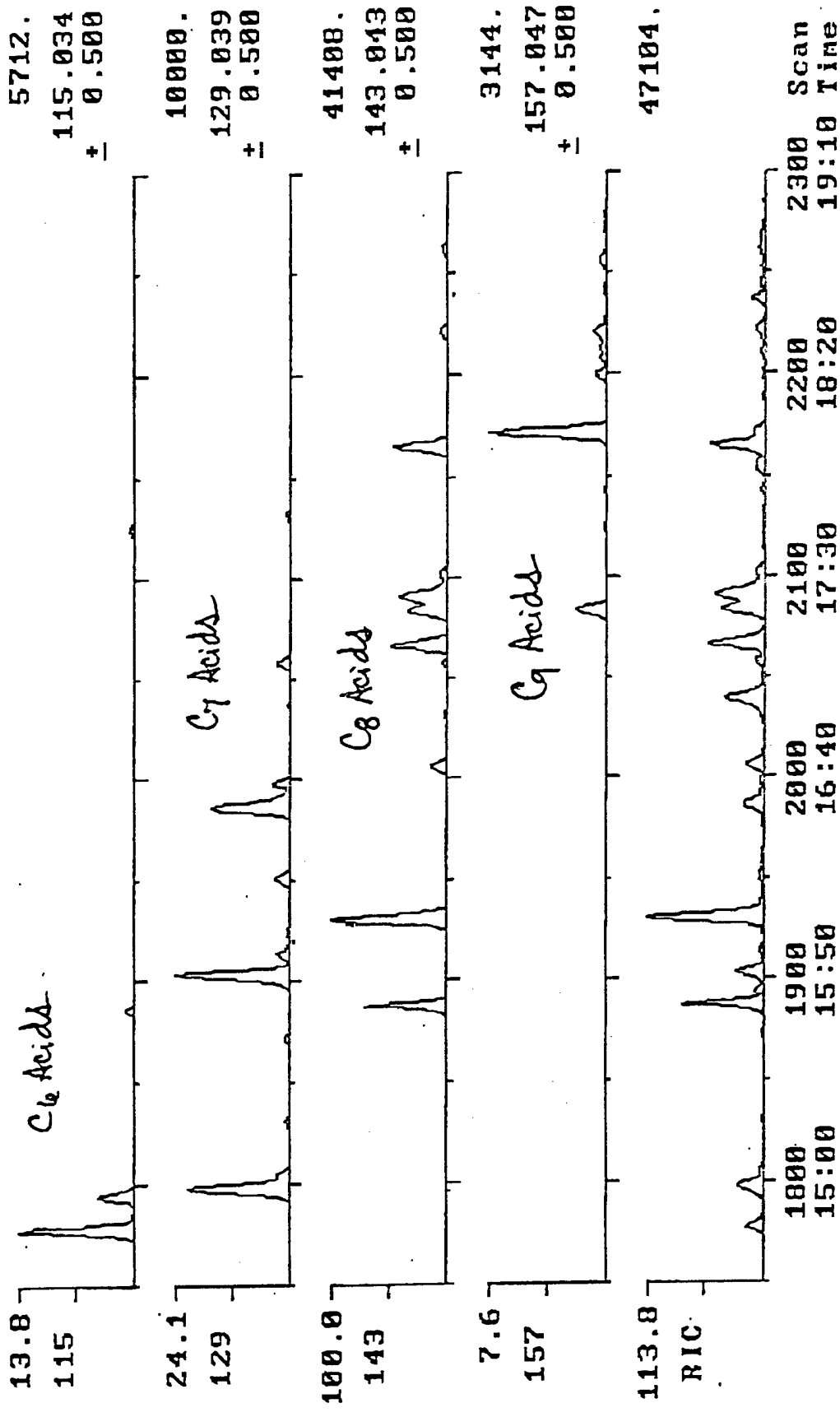


CHRO:

RIC
 04/13/95 17:42:00
 Sample: 50ML SAMPLE MW5
 Conds.: 50C(1M) TO 100C 30C/M TO 300C 6C/M SPLITLESS 1M DB5MS60.25.25
 Range: G 1,4000 Label: N 0, 4.0 Quan: A 0, 1.0 J 0 Base: U 20, 3
 100.0 2414
 Scans 2300 to 3000
 Data: 694MW5 #1
 Cali: NICAL412 #3
 16224.



RIC+Mass Chromatograms Data: 694MW5 #2237 Scans 1750 to 2300
04/13/95 17:42:00 Cali: 694MW5 #3
Sample: 50ML SAMPLE MW5
Conds.: 50C(1M) TO 100C 30C/M TO 300C 6C/M SPLITLESS 1M DB5MS60.25.25
Range: G 1,4000 Label: N 0, 4.0 Quan: A 0, 1.0 J 0 Base: U 20, 3



CHRO:

CHIRO:

RIC+Mass Chromatogram
04/13/95 17:42:00

Data: 694MW5 #2237
Call: 694MW5 #3

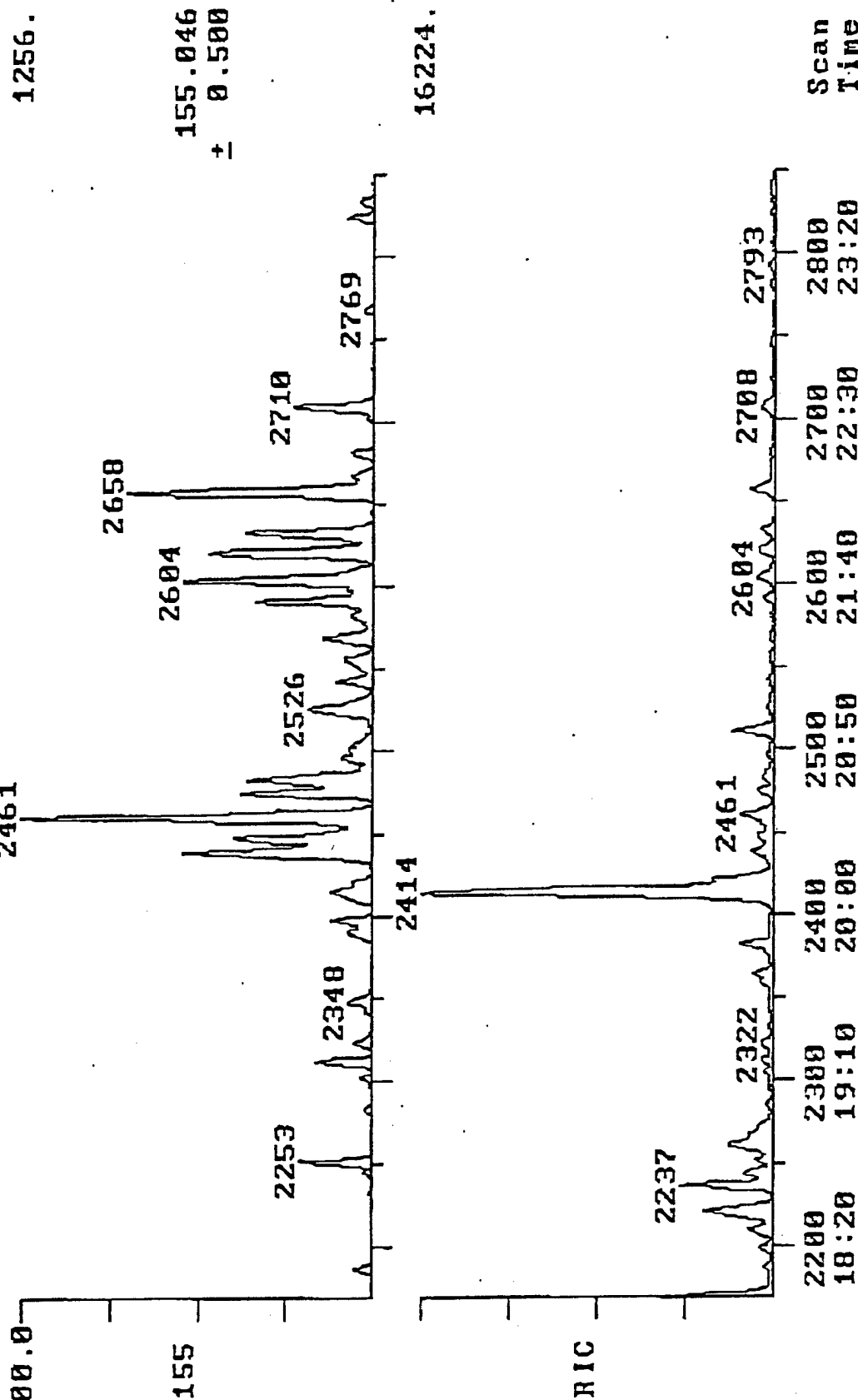
Scans 2170 to 2850

Sample: 50ML SAMPLE MWS

Conds.: 50C(1M) TO 100C 30C/M TO 300C 6C/M SPLITLESS 1M DB5MS60.25.25

Range: G 1,4000 Label: N 0, 4.0 Quan: A 0, 1.0 J 0 Base: U 20, 3

100.07	2461	1256.
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CHRO:

Table I. Quantitative Report and QC Data for Phenols and Aliphatic and Aromatic Acids
for Samples from Rickenbacker AFB (Service Request SF-1-118).

		Concentration ppb							% Extraction Recovery of 50 ppb Spike
		ESMP-13S	ESMP-13D	10 ppb Check Standard	100 ppb Check Standard	Standard Derivative Blank	Standard Derivative Blank	Extraction Method Blank	
1	PROPANOIC ACID - PFB	840	19	17	116	11	16	14	11
2	2-METHYLPROPANOIC ACID - PFB	154	8	14	116	---	6	6	43
3	TRIMETHYLACETIC ACID - PFB	---	12	12	122	---	---	8	113
4	BUTYRIC ACID - PFB	144	7	15	114	8	11	9	33
5	2-METHYLBUTYRIC ACID - PFB	92	---	10	116	---	---	---	91
6	3-METHYLBUTYRIC ACID - PFB	112	---	10	116	---	---	---	86
7	3,3-DIMETHYLBUTYRIC ACID - PFB	---	N.F.	11	118	N.F.	N.F.	N.F.	119
8	PENTANOIC ACID - PFB	43	---	13	113	---	---	7	99
9	2,3-DIMETHYLBUTYRIC ACID - PFB	5	N.F.	11	119	N.F.	N.F.	N.F.	118
10	2-ETHYLBUTYRIC ACID - PFB	N.F.	N.F.	8	117	N.F.	N.F.	N.F.	120
11	2-METHYLPENTANOIC ACID - PFB	9	N.F.	8	115	N.F.	N.F.	N.F.	123
12	3-METHYLPENTANOIC ACID - PFB	5	N.F.	8	112	---	N.F.	N.F.	120
13	4-METHYLPENTANOIC ACID - PFB	---	N.F.	8	112	N.F.	N.F.	N.F.	121
14	HEXANOIC ACID - PFB	29	7	12	115	5	5	---	136
15	2-METHYLHEXANOIC ACID - PFB	---	N.F.	8	113	N.F.	N.F.	N.F.	130
16	PHENOL - PFB	---	---	12	99	---	---	---	113
17	CYCLOPENTANECARBOXYLIC ACID - PFB	5	N.F.	7	107	N.F.	N.F.	N.F.	106
18	5-METHYLHEXANOIC ACID - PFB	---	---	11	110	---	---	---	144
19	o-CRESOL - PFB	N.F.	N.F.	11	127	N.F.	N.F.	N.F.	124
20	2-ETHYLHEXANOIC ACID - PFB	285	---	12	123	---	---	---	126
21	HEPTANOIC ACID - PFB	---	---	10	116	---	---	---	131
22	m-CRESOL - PFB	N.F.	N.F.	11	126	N.F.	N.F.	N.F.	123
23	p-CRESOL - PFB	N.F.	N.F.	11	127	N.F.	N.F.	N.F.	123
24	1-CYCLOPENTENE-1-CARBOXYLIC ACID - PFB	N.F.	N.F.	11	113	N.F.	N.F.	N.F.	96
25	o-ETHYLPHENOL - PFB	N.F.	N.F.	10	126	N.F.	N.F.	N.F.	127
26	CYCLOPENTANEACETIC ACID - PFB	N.F.	N.F.	7	113	N.F.	N.F.	N.F.	120
27	2,6-DIMETHYLPHENOL - PFB	N.F.	N.F.	9	127	N.F.	N.F.	N.F.	118
28	2,5-DIMETHYLPHENOL - PFB	N.F.	N.F.	10	130	N.F.	N.F.	N.F.	122
29	CYCLOHEXANECARBOXYLIC ACID - PFB	---	N.F.	7	111	N.F.	N.F.	N.F.	120
30	3-CYCLOHEXENE-1-CARBOXYLIC ACID - PFB	N.F.	N.F.	11	120	---	N.F.	---	117
31	2,4-DIMETHYLPHENOL - PFB	N.F.	N.F.	10	139	N.F.	N.F.	N.F.	104
32	3,5-DIMETHYLPHENOL & M-ETHYLPHENOL - PFB	N.F.	N.F.	10	132	N.F.	N.F.	N.F.	126
33	OCTANOIC ACID - PFB	---	---	14	118	---	---	---	127
34	2,3-DIMETHYLPHENOL - PFB	N.F.	N.F.	10	127	N.F.	N.F.	N.F.	122
35	p-ETHYLPHENOL - PFB	N.F.	N.F.	10	130	N.F.	N.F.	N.F.	126
36	BENZOIC ACID - PFB	36	33	95	161	---	23	---	159
37	3,4-DIMETHYLPHENOL - PFB	N.F.	N.F.	10	135	N.F.	N.F.	N.F.	119
38	m-METHYLBENZOIC ACID - PFB	20	N.F.	11	110	N.F.	N.F.	N.F.	105
39	1-CYCLOHEXENE-1-CARBOXYLIC ACID - PFB	N.F.	N.F.	11	109	N.F.	N.F.	N.F.	123
40	CYCLOHEXANEACETIC ACID - PFB	N.F.	N.F.	7	111	N.F.	N.F.	N.F.	127
41	2-PHENYLPROPANOIC ACID - PFB	N.F.	N.F.	10	113	N.F.	N.F.	N.F.	118
42	o-METHYLBENZOIC ACID - PFB	---	N.F.	10	118	N.F.	N.F.	N.F.	120
43	PHENYLACETIC ACID - PFB	---	---	10	112	---	---	---	120
44	m-TOLYLACETIC ACID - PFB	N.F.	N.F.	10	100	N.F.	N.F.	N.F.	120
45	o-TOLYLACETIC ACID - PFB	N.F.	N.F.	14	92	N.F.	N.F.	N.F.	143
46	2,6-DIMETHYLBENZOIC ACID - PFB	N.F.	N.F.	12	120	N.F.	N.F.	N.F.	136
47	p-TOLYLACETIC ACID - PFB	N.F.	N.F.	9	104	N.F.	N.F.	N.F.	155
48	p-METHYLBENZOIC ACID - PFB	---	N.F.	10	111	N.F.	N.F.	N.F.	125
49	3-PHENYLPROPANOIC ACID - PFB	---	N.F.	11	108	N.F.	N.F.	N.F.	127
50	2,5-DIMETHYLBENZOIC ACID - PFB	N.F.	N.F.	11	111	N.F.	N.F.	N.F.	120
51	DECANOIC ACID - PFB	---	---	12	112	---	---	---	125
52	2,4-DIMETHYLBENZOIC ACID - PFB	---	N.F.	10	116	N.F.	N.F.	N.F.	119
53	3,5-DIMETHYLBENZOIC ACID - PFB	---	N.F.	9	107	N.F.	N.F.	N.F.	124
54	2,3-DIMETHYLBENZOIC ACID - PFB	N.F.	N.F.	10	114	N.F.	N.F.	N.F.	121
55	4-ETHYLBENZOIC ACID - PFB	N.F.	N.F.	10	113	N.F.	N.F.	N.F.	116
56	2,4,6-TRIMETHYLBENZOIC ACID - PFB	---	N.F.	10	121	N.F.	N.F.	N.F.	120
57	3,4-DIMETHYLBENZOIC ACID - PFB	---	N.F.	10	105	N.F.	N.F.	N.F.	117
58	2,4,5-TRIMETHYLBENZOIC ACID - PFB	N.F.	N.F.	9	115	N.F.	N.F.	N.F.	131

*** Indicates concentration of extract was below lowest calibration standard (5 ppb).

N.F. Indicates not found.

APPENDIX B-4

INFORMAL TECHNICAL INFORMATION REPORT (IT, 1995B)



11499 Chester Road
Cincinnati, Ohio 45246-4012
513-782-4700
Fax: 513-782-4807

18 September 1995

Mr. Alan Friedstrom, P.E.
OLR, AFBCA
2146 Club Road, Building 548
Rickenbacker ANGB, Ohio 43217-5548

RE: AFCEE Contract No. 41624-94-D-8047 D.O. 0008, 409878.005.05.001
Sampling of Site 1, Hazardous Waste Storage Area

Dear Mr. Friedstrom:

Enclosed is a summary ITIR for the sampling recently completed at Building 560, RCRA Site 1, including:


- Text summary of field activities
- Tables presenting all field and analytical results.
- Discussion of the geoprobe sampling and analyses near well ESMP-17s.

We are also forwarding at this time, a copy of the data directly to Mr. Jeff Black of Parsons, Denver, for his incorporation into their October deliverable.

Please call either me or Karl Van Keuren if we can provide additional information.

Sincerely,

IT CORPORATION



Bernard J. Franks
Project Manager

BJF:srm
Enclosure

cc: Jeff Black, Parsons (with enclosure)
Dean Dunn, AFCEE/ERB (letter only)
Richard Haines, OLR, AFBCA (letter only)

Informal Technical Information Report

**Groundwater Sampling
Site 1, Hazardous Waste Storage Area
Building 560**

Rickenbacker ANGB, Ohio

18 September 1995

RANGB Hazardous Waste Storage Area (560)

August 1995 Sampling

Field activities conducted by IT personnel from 15 August to 22 August 1995 at the Hazardous Waste Storage Area, in support of Parsons post-closure deliverable due in October 1995, consisted of:

- measuring groundwater levels in 34 well points and monitoring wells
- measuring groundwater level and free product thickness in MW-5
- sampling four monitoring wells for first quarter RCRA samples
- sampling twelve half-inch diameter well points and three monitoring wells for natural attenuation parameters
- geoprobe sampling and analysis of the northern extent of contamination.

Groundwater elevations were measured to the nearest hundredth foot using a SINCO water level probe (Table 1). Free product thickness was also measured in MW-5 using an ORS oil-water interface probe.

All samples collected were analyzed in the field for pH, temperature, conductivity, oxidation reduction potential (ORP), and dissolved oxygen (Table 2). On 8/16/95, an attempt was made to analyze a sample using 9 Hach field kits for a variety of parameters. This process was determined to be ineffective and time consuming. After consulting with the BEC and reviewing notes from the initial USEPA well installation and sampling protocols, the number of field analyses was reduced to ferrous iron and sulfide. After the first day of sampling, it was decided to add alkalinity as a third parameter measured in the field. Results of the field analyses are presented in Table 3. Other natural attenuation parameters were analyzed in a laboratory. A list of all field and laboratory analyses is provided in Table 4. Most laboratory analyses were performed by PDP Analytical in Spring, Texas, with results presented on copies of Form 1 (Attachment A). Methane, ethane, and ethene, were analyzed in IT's Biotechnology Applications Center laboratory in Knoxville, Tennessee. Data are presented in a Certificate of Analysis at the front of Attachment A.

One field variance should be noted. The initial plan indicated sampling from 23 wells, all initially sampled during well installation in 1995. During the August resampling period, several of the shallow well points were unable to be purged of adequate volumes of water and samples were not collected for field or laboratory analyses. After one hour of purging was attempted at these points, it was decided, in consultation with the BEC, to eliminate these wells from further sampling. These wells are: ESMP-2S, ESMP-3S, ESMP-6S, and ESMP-12S.

In addition to the groundwater monitoring well sampling conducted, four Geoprobe soil borings, 560-01, 560-02, 560-03, and 560-04 were advanced radially upgradient of monitoring point ESMP-17s (Figure 1), on August 15th and 16th. The purpose of these borings was to collect additional shallow groundwater data to delineate the extent of the vinyl chloride (VC), cis-dichloroethene (cis-DCE), and trans-dichloroethene (trans-DCE) detected in monitoring point ESMP-17s.

The Geoprobe drilling program was conducted by using a Geoprobe 8M van-mounted hydraulic sampler. Boreholes were advanced using 1.125-inch inside diameter (ID) (1.375 nominal outside diameter) lead samplers and drive-shoes and 1-inch drill rods through the application of downhole pressure. Each soil boring was continuously sampled by advancing the lead sampler and drive shoe to substrate 24 inches. Following advancement, the lead sampler was removed from the boring. Soil sampling for lithologic description and flame ionization detector (FID) screening was conducted by using a clear acetate liner in the lead sampler. Lithologic descriptions are presented in the attached Soil Boring Logs. No FID readings were recorded above background readings. Each soil borings was advanced to a minimum of two feet below first encountered groundwater. Well points were then installed to collect groundwater samples. Well points consisted of a 1.25-inch ID by 2-foot slotted rods.

Following installation, the well points were developed and purged using a disposable Teflon tube bailer and a peristaltic pump. Each well point was first surged with the tube bailer and then pumped with the peristaltic pump, until either turbidity cleared or the well point was pumped dry.

Each well point was sampled using pre-cleaned, disposable equipment. Groundwater samples were collected using the following sampling technique:

- A disposable Teflon tube bailer was used at each well point. The bailer was lowered and withdrawn slowly from the monitoring well to minimize agitation of the groundwater. The recovered groundwater was then transferred from the bailer to a clean sample bottle. The sample bottle was labeled as to time and date collected, analyses requested, capped and immediately placed in an ice bath.
- Clean latex gloves were worn while sampling at each monitoring well.

Two equipment rinsate sample were collected from decontaminated slotted rods to evaluate the effectiveness of the decontamination procedures. The rinsate samples were collected by the following method:

- Deionized water was allowed to pour down through the entire length of the slotted rod.
- The rinsate water was then collected in clean sample bottles and labeled as to time and date collected and analyses requested, capped, and immediately placed on ice.

The groundwater samples collected from the well points and the rinsate samples were analyzed for Volatile Organic Compounds (VOCs). A total of four groundwater samples and two rinsate samples were collected. Analytical results for the samples collected from well points 560-02, 560-03, 560-04 were all nondetect (ND) for VOCs. VOCs were detected in the sample collected from well point 560-01; VC at 26 micrograms per liter (ug/l), cis-DCE at 27 ug/l, and trans-DCE at a laboratory estimated 4 ug/l. Analytical results for the rinsate sample R081695 were nondetect for VOCs. One VOC was detected in rinsate sample R081795; methylene chloride at a laboratory estimated 2 ug/l. The data are presented on Figure 1.

Table 1
Groundwater Elevations 15 August 1995
Referenced from Top of Inside Casing
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 1 of 2

Well ID	Time	Depth to Water (feet)
MW-2	1702	12.14
MW-3	1656	10.46
MW-4	1625	11.38
MW-5	1723	13.37 (13.31 to free product)
MW-6	1602	13.75
MW-8	1747	10.53
MW-9	1629	8.05
MW-10	1706	11.23
MW-11	1548	12.19
MW-12	1520	13.10
ESMP-1S	1646	7.43
ESMP-1D	1651	10.17
ESMP-2S	1726	3.57
ESMP-2D	1728	6.18
ESMP-3S	1609	7.68
ESMP-3D	1611	10.69
ESMP-4S	1553	5.94
ESMP-4D	1556	11.15
ESMP-5S	1358	3.83
ESMP-5D	1354	6.20
ESMP-6S	1517	10.79
ESMP-6D	1518	9.69

Table 1
Groundwater Elevations 15 August 1995
Referenced from Top of Inside Casing
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 2 of 2

Well ID	Time	Depth to Water (feet)
ESMP-7S	1513	6.02
ESMP-7D	1514	5.96
ESMP-8S	1503	3.76
ESMP-8D	1504	6.17
ESMP-8DD	1505	7.38
ESMP-9S	1456	3.38
ESMP-9D	1458	6.53
ESMP-10S	1450	6.15
ESMP-10D	1451	6.41
ESMP-11S	1508	6.66
ESMP-11D	1509	7.11
ESMP-12S	1621	2.57
ESMP-13S	1711	10.34
ESMP-13D	1717	10.06
ESMP-14S	1738	10.13
ESMP-14D	1736	9.89
ESMP-14DD	1739	9.72
ESMP-15S	1743	9.45
ESMP-15D	1744	8.98
ESMP-16S	1634	8.00
ESMP-16D	1635	8.77
ESMP-17S	1750	9.19

Table 2
Water Quality Data
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 1 of 3

Well ID	Date	Time	Volume (gallons) Purged	Temperature (Celsius)	pH (S.U.)	Conductivity (millimhos/cm)	ORP (mV)	Dissolved Oxygen (mg/L)
MW-3	8/17/95	1616	0.0	19.0	6.55	0.843	152	1.4
		1618	1.0	18.5	6.61	0.825	147	1.0
		1620	2.0	18.2	6.67	0.830	159	1.6
		1623	3.0	17.0	6.70	0.776	157	1.8
MW-4	8/17/95	1026	0.0	20.6	6.61	0.680	196	1.7
		1028	1.0	19.5	6.57	0.808	207	1.1
		1030	2.0	19.4	6.60	0.827	204	1.2
		1031	2.5	19.2	6.62	0.781	202	1.6
		1033	3.5	18.8	6.64	0.783	202	1.6
		1034	4.5	18.1	6.66	0.765	200	1.6
		1056	-	18.4	6.52	0.800	231	2.0
MW-6	8/17/95	1512	0.0	19.6	6.43	0.929	83	1.0
		1514	1.5	17.3	6.45	0.787	60	0.9
		1516	3.0	17.3	6.48	0.849	47	1.1
		1519	3.5	17.5	6.55	0.841	42	1.1
		1522	5.0	17.5	6.57	0.833	41	1.1
MW-8	8/17/95	1131	0.0	20.5	6.64	0.695	187	1.1
		1132	1.0	19.0	6.69	0.649	186	2.1
		1134	2.5	18.1	6.70	0.650	186	2.5
		1136	3.5	18.0	6.72	0.646	186	3.4
		1139	4.0	18.0	6.92	0.656	183	5.4
		1358	-	18.8	6.69	0.753	233	4.3
MW-11	8/16/95	1710	0.0	20.1	7.00	0.575	183	3.7
		1716	1.0	18.5	6.86	0.568	189	4.1
		1719	3.0	18.9	7.01	0.560	179	4.6
		1720	3.5	18.6	7.00	0.556	179	4.8

Table 2
Water Quality Data
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 2 of 3

Well ID	Date	Time	Volume (gallons) Purged	Temperature (Celsius)	pH (S.U.)	Conductivity (millimhos/cm)	ORP (mV)	Dissolved Oxygen (mg/L)
		1722	4.5	18.2	7.01	0.560	178	4.7
MW-12	8/16/95	1422	0.0	20.1	6.75	0.832	141	2.0
		1425	0.5	18.9	6.80	0.813	139	2.9
		1427	2.0	18.2	6.81	0.807	136	3.2
		1429	3.5	18.0	6.85	0.789	122	2.9
		1432	4.5	19.4	6.82	0.780	112	2.5
		1433	5.0	17.5	6.83	0.774	111	2.4
		1520	-	17.4	6.81	0.834	143	1.0
ESMP-2D	8/21/95	1515	0.0	17.3	6.74	0.726	-65	0.7
		1517	0.3	16.4	6.65	0.730	-68	0.5
		1519	0.5	16.2	6.79	0.728	-76	0.3
		1530	2.0	17.1	6.76	0.740	-59	0.6
ESMP-3D	8/21/95	1427	0.0	17.9	6.67	0.822	-48	1.3
		1430	0.25	16.2	6.57	0.819	-46	1.4
		1433	0.35	16.2	6.73	0.818	-48	1.3
		1445	1.5	16.4	6.78	0.798	-51	1.3
ESMP-4S	8/22/95	1248	0.15	21.8	6.58	-	67	2.9
		1250	0.25	21.5	6.51	-	73	2.5
		1307	1.0	23.6	6.58	-	83	0.8
ESMP-4D	8/21/95	1208	0.0	21.1	6.57	0.986	20	1.4
		1214	0.5	18.9	6.65	0.930	37	1.3
		1220	0.8	18.9	6.68	0.915	42	1.3
		1226	1.2	17.5	6.66	0.905	57	1.4
ESMP-6D	8/21/95	1040	0.0	20.9	6.73	0.812	10	1.5
		1045	0.2	19.2	6.70	0.831	-11	1.3
		1049	0.4	19.9	6.69	0.815	-14	1.0

Table 2
Water Quality Data
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 3 of 3

Well ID	Date	Time	Volume (gallons) Purged	Temperature (Celsius)	pH (S.U.)	Conductivity (millimhos/cm)	ORP (mV)	Dissolved Oxygen (mg/L)
		1115	2.0	19.8	6.70	0.839	-31	1.3
ESMP-8S	8/18/95	1012	0.5	25.3	7.54	0.578	156	6.7
ESMP-10S	8/18/95	1319	0.0	23.4	7.09	0.667	165	4.3
		1424	0.3	22.7	7.31	0.687	159	6.4
ESMP-13S	8/22/95	1104	0.0	18.0	6.95	-	-125	1.0
		1106	0.2	16.4	6.95	-	-122	0.7
		1116	1.0	17.2	6.96	-	-125	0.4
ESMP-14D	8/21/95	1643	0.0	17.0	6.74	0.042	-148	0.6
		1646	0.25	16.0	6.82	0.044	-147	0.1
		1648	0.4	15.4	6.78	0.045	-134	0.7
		1650	0.45	15.5	6.79	0.045	-126	0.6
		1659	2.5	16.1	6.73	0.046	-89	0.7
ESMP-16S	8/22/95	0930	0.0	19.6	6.78	-	-141	0.9
		0934	0.25	18.0	6.79	-	-146	0.5
		0941	1.75	19.1	6.82	-	-134	0.4
ESMP-16D	8/21/95	1602	0.0	19.1	6.69	0.043	-145	0.4
		1605	0.3	16.6	6.72	0.044	-153	0.3
		1606	0.4	16.6	6.74	0.044	-153	0.4
		1624	2.0	19.0	6.74	0.044	-126	0.8
ESMP-17S	8/22/95	0855	0.2	17.9	6.93	-	-85	0.4
		0859	0.4	17.6	6.96	-	-102	0.4
		0910	1.7	17.9	6.97	-	-113	0.5

Missing conductivity measurements were the result of a faulty conductivity probe, which was removed from use; no replacement was available.

Table 3
HACH Test Kit Results
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 1 of 1

Well ID	Date	Ferrous Iron (mg/L)	Sulfide (mg/L)	Alkalinity (mg/L as CaCO ₃)	Comments
ESMP-2D	8/21/95	1.51	0.007	500	
ESMP-3D	8/21/95	1.26	0.006	480	
ESMP-4S	8/22/95	-	0.648	520	Sample too turbid for accurate reading for ferrous iron
ESMP-4D	8/21/95	0.65	0.113	520/500	Original/Duplicate
ESMP-6D	8/21/95	1.32/1.33	0.006/0.005	540/480	Original/Duplicate
ESMP-8S	8/18/95	0.37	0.283	380	
ESMP-10S	8/18/95	-	0.421/0.386	400/400	Sample too turbid for ferrous iron. Original/Duplicate
ESMP-13S	8/22/95	2.72/2.84	0.011/0.009	460/460	Original/Duplicate
ESMP-14D	8/21/95	1.58	0.044	420	
ESMP-16S	8/22/95	2.94	0.012	560	2:1 dilution for ferrous iron
ESMP-16D	8/21/95	2.34	0.028	500	2:1 dilution for ferrous iron
ESMP-17S	8/22/95	2.69	0.017	460	
MW-3	8/17/95	0.37	0.078	-	
MW-4	8/17/95	0.07	0.051	-	
MW-5	8/17/95	2.62	0.365	-	
MW-6	8/17/95	0.43	0.270	-	
MW-8	8/17/95	0.42	0.261	-	
MW-11	8/17/95	0.24	0.118	-	
MW-12	8/16/95	1.10	0.091	480	

Table 4
Analytical Parameters
Site 1, Hazardous Waste Storage Area (560)
Rickenbacker ANGB
Page 1 of 1

Well	VOC	SVOC	Metals (unfiltered)	Metals (filtered)	Natural Attenuation Parameters ¹	Field Parameters ²
MW-4	X	X	X	X	X	X
MW-8	X	X	X	X	X	X
MW-11	X	X	X	X	X	X
MW-12	X	X	X	X	X	X
MW-3	X				X	X
MW-5	X				X	X
MW-6	X				X	X
ESMP-2D	X				X	X
ESMP-3D	X				X	X
ESMP-4S	X				X	X
ESMP-4D	X				X	X
ESMP-6D	X				X	X
ESMP-8S	X				X	X
ESMP-10S	X				X	X
ESMP-13S	X				X	X
ESMP-14D	X				X	X
ESMP-16S	X				X	X
ESMP-16D	X				X	X
ESMP-17S	X				X	X

¹ Natural attenuation parameters included methane, ethene, ammonia, nitrogen, nitrite, nitrate, sulfate, alkalinity, and chloride.

² Field Parameters included pH, temperature, conductivity and the following natural attenuation parameters: ferrous iron, sulfide, alkalinity, dissolved oxygen, and oxidation reduction potential.



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CORPORATION

Figure 1.

Site 1 Geoprobe Investigation,
Rickenbacker Air National Guard Base

DRAWING
BY

ITEM
9/13/95

CHECKED BY
APPROVED BY

DRAWING NO.
M-409878-9/95-D

Legend

(680 µg/L VC) Duplicate Analysis

○ Monitoring point, Parsons ES 1995

560-04
ND Analytical Result, 8/95

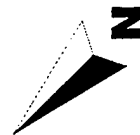
● Geoprobe Boring

ND Non Detect

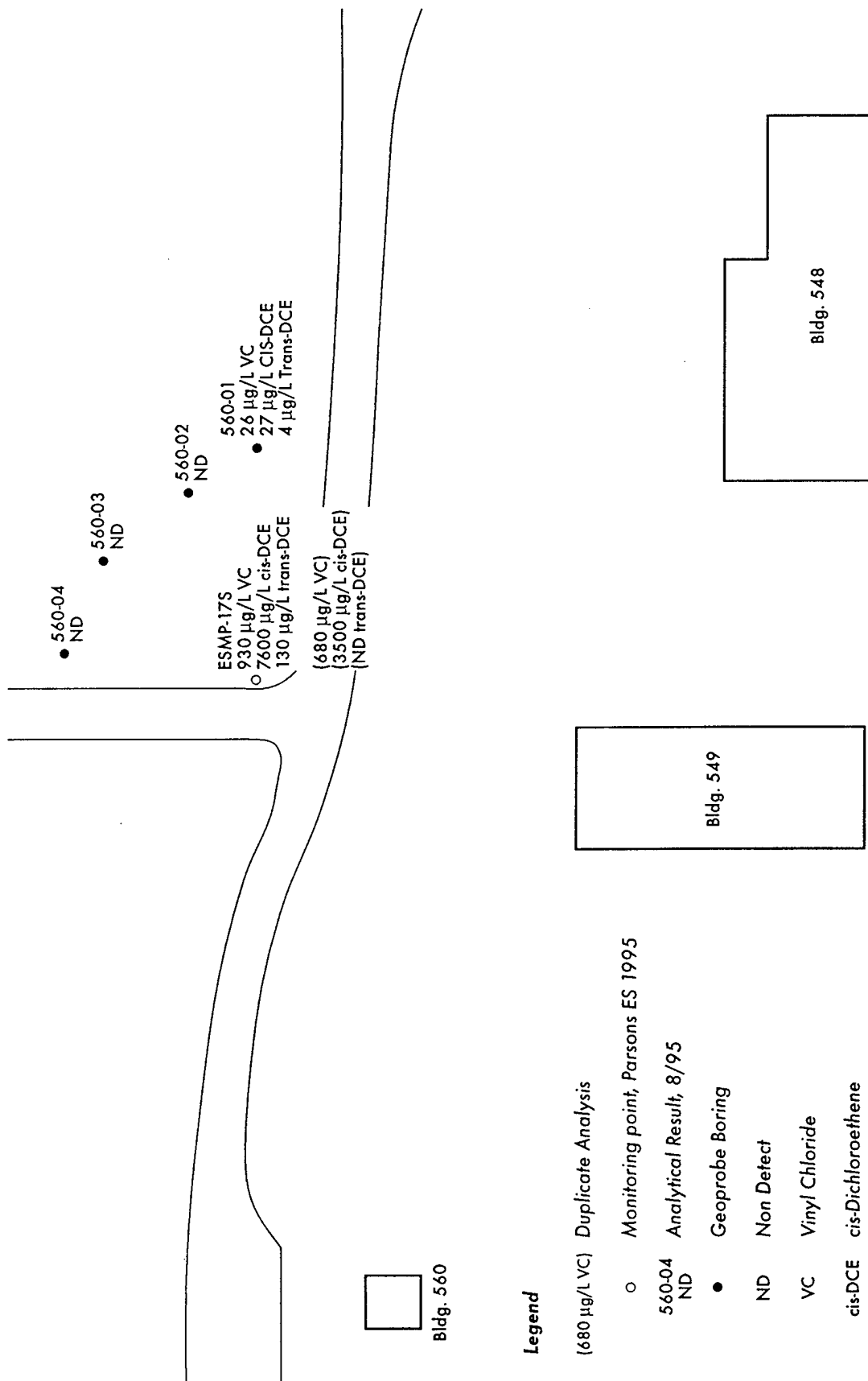
VC Vinyl Chloride

cis-DCE cis-Dichloroethene

trans-DCE trans-Dichloroethene



0 30 60
Scale in Feet





INTERNATIONAL
TECHNOLOGY
CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 409878	PROJECT NAME: RANGB		DATE: 08-15-95
BORING NUMBER: 560-01	COORDINATES:		DATE STARTED: 08-15-95
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED: 08-15-95
ENGINEER/GEOLOGIST: P. McCARREN	Depth	Date/Time	PAGE 1 OF 1
DRILLING METHODS: GEOPROSE			

DEPTH (FT)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY %	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	FID READING (PPH)	REMARKS
0				0.0 - 6.0 10yr 4/4 dark yellowish H brown silty clay, trace gravel, medium plasticity, very stiff, damp			0.8	
5								
6				6.0 - 12.0 10yr 4/1, dark grey clayey silt, trace medium sand, stiff, damp			0.8	
10								
12				12.0 - 14.0 10yr 4/1, dark grey sand & gravel well graded, little fines, loose, wet			0.8	SCREEN SET 12' - 14' BGS
14								
15				Bottom of Boring 14.0				
20								
25								
30								

NOTES:

GEOPROSE COMPANY: PHILIP ENVIRONMENTAL
OPERATOR: BARRY SOWER



INTERNATIONAL
TECHNOLOGY
CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 409878	PROJECT NAME: RANGB		DATE: 08-15-95
BORING NUMBER: 560-02	COORDINATES:		DATE STARTED: 08-15-95
ELEVATION:	GWL: Depth	Date/Time	DATE COMPLETED: 08-15-95
ENGINEER/GEOLOGIST: P. McARZEN	Depth	Date/Time	PAGE 1 OF 1
DRILLING METHODS: GEOPROBE			

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY %	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	FID READING (APM)	REMARKS
0				0.0 - 4.0 10yr 4/4 dark yellowish brown silty clay, trace gravel, medium plasticity very stiff, damp			0.8	
5								
6				6.0 - 11.5 10yr 4/1 dark grey clayey silt, trace medium sand, stiff, damp			0.8	
10								
11.5				11.5 - 14.0 10yr 4/1 dark grey sand/silt well graded, loose, wet			0.8	SCREEN SET 12" - 14" BGS
14								
15				Bottom of boring 14.0				
20								
25								
30								

NOTES:

GEOPROBE COMPANY: PH. L. A. ENVIRONMENTAL
OPERATOR: BARRY SOWER



INTERNATIONAL
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VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 409878	PROJECT NAME: RANGB		
BORING NUMBER: 560-03	COORDINATES:		DATE: 08-16-95
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 08-16-95
ENGINEER/GEOLOGIST: P. McCARREN	Depth	Date/Time	DATE COMPLETED: 08-16-95
DRILLING METHODS: GEOPROSE			PAGE 1 OF 1

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY %	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	FID READING (PPH)	REMARKS
0				0.0 - 8.0 10yr 4/4 dark yellowish brown silty clay, trace gravel, medium plasticity, very soft, sand			0.6	
8				8.0 - 10.0 10yr 4/1, dark grey sand & gravel, well graded, trace silt loose, wet			0.6	SCREEN SET 8'-10' BGS
10				10.0 - 14.0 10yr 3/1, very dark grey silt, hard, wet			0.6	
14				Bottom of Boring 14.0				
15								
20								
25								
30								

NOTES:

GEOPROSE COMPANY: PH. LA ENVIRONMENTAL
OPERATOR: BARRY SOWER



INTERNATIONAL
TECHNOLOGY
CORPORATION

VISUAL CLASSIFICATION OF SOILS

PROJECT NUMBER: 409878	PROJECT NAME: RANGB		
BORING NUMBER: 560-04	COORDINATES:		DATE: 08-14-95
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED: 08-16-95
ENGINEER/GEOLOGIST: P. McCARREN	Depth	Date/Time	DATE COMPLETED: 08-16-95
DRILLING METHODS: GEOPROBE			PAGE 1 OF 1

DEPTH (ft)	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER (N/A)	RECOVERY %	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	FID READING (PPH)	REMARKS
0				0.0-12.0 10YR 4/1 dark yellowish brown silty clay, trace gravel under plasticity, very stiff, damp			0.8	
5								
10								
12				12.0-14.0 10YR 4/1 dark gray mud and gravel, well graded, loose, wet			0.8	SCREEN SET 12' - 14' BGS
14								
15				Bottom of core 14.0				
20								
25								
30								

NOTES:

GEOPROBE COMPANY: PH.L.A. ENVIRONMENTAL
OPERATOR: BARRY SOWER